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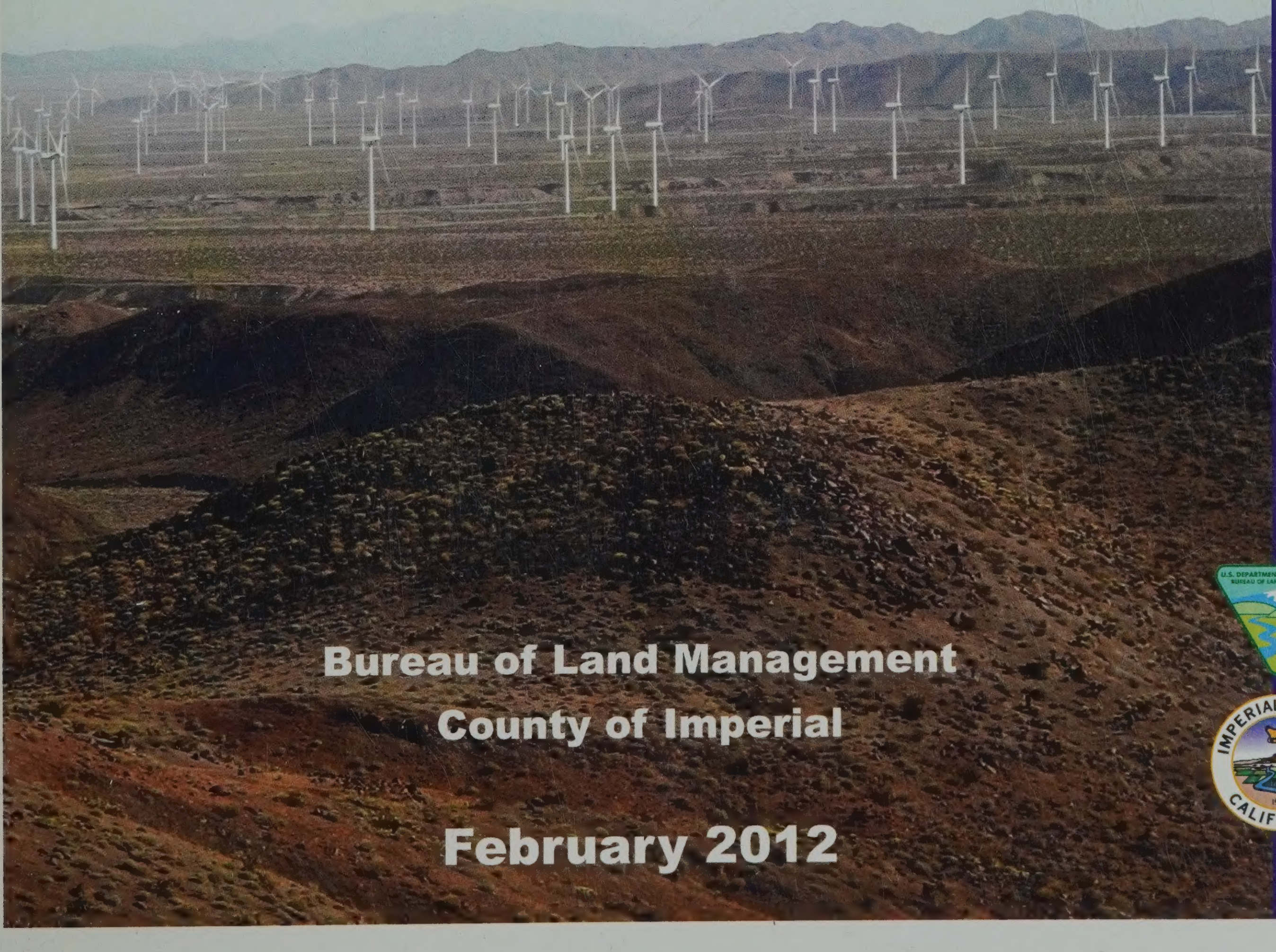
Proposed Plan Amendment and Final Environmental Impact Statement/ Final Environmental Impact Report

for the

Ocotillo Wind Energy Facility

Volume 6 of 7

Appendix O (part 1)



Bureau of Land Management
County of Imperial

February 2012

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O. Comment Letters on the Draft EIS/EIR

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Appendix O

Comment Letters on the Draft EIS/EIR

The comment letters are arranged in the order listed in Tables 5-1 and 5-2 of Chapter 5.

Federal Agencies

State Agencies

Local Agencies

Native American Tribes

Organizations

Public

Late Comments

Comments from Native America Tribes Submitted After Public Comment Period

U.S. Department of Homeland Security
FEMA Region IX
1111 Broadway, Suite 1200
Oakland, CA. 94607-4052

FEMA

August 18, 2011

Meris Bantilan-Smith
U. S. Army Corps of Engineers, Los Angeles District
Regulatory Division – Carlsbad Field Office
Attn: CESPL-RG-S-2010-00142-LLC
6010 Hidden Valley, Suite 105
Carlsbad, California 92011

Dear Ms. Bantilan-Smith:

This is in response to your request for comments on Public Notice SPL# 2009-00971-MBS, Ocotillo Wind Energy Facility Project in El Centro, Imperial County, California.

Please review the current effective Flood Insurance Rate Maps (FIRMs) for the County of Imperial (Community Number 060065) and City of El Centro (Community Number 060670), Maps revised September 26, 2008. Please note that the City of El Centro, County of Imperial, California is a participant in the National Flood Insurance Program (NFIP). The minimum, basic NFIP floodplain management building requirements are described in Vol. 44 Code of Federal Regulations (44 CFR), Sections 59 through 65. **F1-01**

A summary of these NFIP floodplain management building requirements are as follows:

- All buildings constructed within a riverine floodplain, (i.e., Flood Zones A, AO, AH, AE, and A1 through A30 as delineated on the FIRM), must be elevated so that the lowest floor is at or above the Base Flood Elevation level in accordance with the effective Flood Insurance Rate Map. **F1-02**
- If the area of construction is located within a Regulatory Floodway as delineated on the FIRM, any ***development*** must not increase base flood elevation levels. **The term *development* means any man-made change to improved or unimproved real estate, including but not limited to buildings, other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, and storage of equipment or materials.** A hydrologic and hydraulic analysis must be performed *prior* to the start of development, and must demonstrate that the development would not cause any rise in base flood levels. No rise is permitted within regulatory floodways. **F1-03**

- Upon completion of any development that changes existing Special Flood Hazard Areas, the NFIP directs all participating communities to submit the appropriate hydrologic and hydraulic data to FEMA for a FIRM revision. In accordance with 44 CFR, Section 65.3, as soon as practicable, but not later than six months after such data becomes available, a community shall notify FEMA of the changes by submitting technical data for a flood map revision. To obtain copies of FEMA's Flood Map Revision Application Packages, please refer to the FEMA website at http://www.fema.gov/business/nfip/forms.shtm.

F1-04

Please Note:

Many NFIP participating communities have adopted floodplain management building requirements which are more restrictive than the minimum federal standards described in 44 CFR. Please contact the local community's floodplain manager for more information on local floodplain management building requirements. The Imperial County floodplain manager can be reached by calling Brian Donley, Building Official, at (760) 482-4311.

F1-05

If you have any questions or concerns, please do not hesitate to call Robert Durrin of the Mitigation staff at (510) 627-7057.

Sincerely,

Gregor Blackburn, CFM, Branch Chief
Floodplain Management and Insurance Branch

cc:
Brian Donley, Building Official, Imperial County
Garret Tam Sing/Salomon Miranda, State of California, Department of Water Resources, Southern Region Office
Robert Durrin, Floodplanner, CFM, DHS/FEMA Region IX
Alessandro Amaglio, Environmental Officer, DHS/FEMA Region IX

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

OCT - 6 2011

Cedric Perry
Bureau of Land Management
California Desert District Office
22835 Calle San Juan de Los Lagos
Moreno Valley, CA 92553-9046

Subject: Draft Plan Amendment and Draft Environmental Impact Statement for the Proposed Ocotillo Wind Energy Facility, Imperial County, California

Dear Mr. Perry,

The U.S. Environmental Protection Agency has reviewed the Draft Plan Amendment to the California Desert Conservation Area Plan and the Draft Environmental Impact Statement for the Ocotillo Wind Energy Facility (OWEF) Imperial County, California. Our comments are provided pursuant to the National Environmental Policy Act, Council on Environmental Quality regulations (40 CFR Parts 1500-1508), and our NEPA review authority under Section 309 of the Clean Air Act.

EPA supports increasing the development of renewable energy resources, as recommended in the National Energy Policy Act of 2005, in an expeditious and well planned manner. Using renewable energy resources such as wind power can help the nation meet its energy requirements while reducing greenhouse gas emissions. We encourage BLM to apply its land management and regulatory authorities in a manner that will promote a long-term sustainable balance between available energy supplies, energy demand, and protection of ecosystems and human health. **F2-01**

Pattern Energy through Ocotillo Express LLC (the applicant) has filed an application for a right-of-way authorization with the BLM to construct, operate, maintain, and decommission a wind energy facility that would generate up to 465-MW of energy and be located on approximately 12,436-acres of BLM land. The proposed Project includes wind turbine generators, a substation, an operations and maintenance facility, transmission lines, temporary construction lay down areas, four met towers and one observation tower. In addition, twenty six acres of private land would be developed and 487 acres of private and public land outside the project boundaries would be utilized for road access and collection lines.

On January 28, 2011, EPA provided formal scoping comments for the proposed Project. We identified several issues, including potential impacts to water resources, biological resources, habitat, and air quality, as well as the cumulative impacts to these resources. **F2-02**

We commend the applicant for redesigning the project to reduce impacts to waters and other resources; however, EPA has concerns regarding BLM's preferred alternative, which would generate energy in excess of the Applicant's Power Purchase Agreement with San Diego Gas and Electric, and have the greatest environmental impacts of all the alternatives considered. Based on our review of the subject **F2-03**

DEIS, we have rated the project and the document as *Environmental Concerns – Insufficient Information* (EC-2). Please see the enclosed "Summary of Rating Definitions." An "EC" signifies that EPA's review of the DEIS has identified environmental impacts that should be avoided in order to provide adequate protection for the environment. A "2" rating signifies that the DEIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment. We believe that changes to the preferred alternative, such as a reduction in the number of turbines and/or modifications in the placement of turbines, could further reduce impacts while still meeting the purpose and need for the project. We also believe that Alternative 3 is the environmentally preferable alternative and should be given further consideration.

F2-03 cont

The enclosed detailed comments provide specific recommendations regarding analyses and documentation to assist in assessing potential significant impacts from the proposed Project. EPA appreciates BLM's coordination to date and the opportunity to provide input on the OWEF project. If you have any questions, please contact me at (415) 972-3521, or contact Anne Ardillo, the lead reviewer for this project. Anne can be reached at (415) 947-4257 or ardillo.anne@epamail.epa.gov.

Sincerely,

Kathleen Martyn Goforth

Kathleen Martyn Goforth, Manager
Environmental Review Office (CED-2)

Enclosures: EPA Summary of Rating Definitions
EPA Detailed Comments

cc:
Imperial County
Barona Band of Diegueno Indians
Campo Kumeyaay Nation
Cocopah Indian Tribe
Ewiiaapaayp Band of Kumeyaay Indians
Jamul Indian Village
Kwaaymii Laguna Band of Indians
La Posta Band of Kumeyaay Indians
Manzanita Band of Kumeyaay Indians
Mesa Grande Band of Mission Indians
Quechan Indian Tribe
San Pasqual Band of Diegueno Indians
Santa Ysabel Band of Diegueno Indians
Sycuan Band of Kumeyaay Nation
Torres Martinez Desert Cahuilla Indians
Viejas Band of Kumeyaay Indians

SUMMARY OF EPA RATING DEFINITIONS*

This rating system was developed as a means to summarize the U.S. Environmental Protection Agency's (EPA) level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the Environmental Impact Statement (EIS).

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

ADEQUACY OF THE IMPACT STATEMENT

"Category 1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, Policy and Procedures for the Review of Federal Actions Impacting the Environment.

U.S. EPA DETAILED COMMENTS ON THE DRAFT PLAN AMENDMENT AND DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED OCOTILLO WIND ENERGY FACILITY, IMPERIAL COUNTY, CALIFORNIA, OCTOBER 6, 2011

Preferred Alternative

The DEIS states that the BLM has identified the preferred alternative as Alternative 1, the proposed action, which would install 155Wind Turbine Generators (WTGS) (from 1.6-3.0-MW) on both the northern site and southern site in two phases, producing up to 465 MW of energy. The applicant has signed a Power Purchase Agreement with San Diego Gas and Electric for 315 MW. Alternative 1 would generate an additional 150-MW of energy for which there is no Power Purchase Agreement. The DEIS does not explain the rationale for selecting Alternative 1 as the preferred alternative. **F2-04**

Alternative 2 would install 137 WTGs (2.5MW), generating 315 MW of energy, satisfying the Power Purchase Agreement. Imperial County, the CEQA lead agency, has identified Alternative 3, the installation of 105 WTGs (3.0 MW), also generating 315 MW of energy, as the environmentally superior alternative. Both Alternatives would install fewer turbines than would Alternative 1 and would, therefore, result in less environmental disturbance. The DEIS has identified several resource areas that would experience reduced impacts under Alternative 2 and Alternative 3, including aquatic resources, natural habitats, cultural and paleontological resources, and air quality. Alternatives 2 and 3 would also have less visual impacts, and would require less water for construction (p. 2-26). Based on the information provided in the DEIS, EPA believes that Alternative 3 is the environmentally preferable alternative. **F2-05**

> *Recommendations:*
> The FEIS should explain BLM's rationale for choosing Alternative 1 as the preferred alternative, and discuss how the applicant would sell the additional 150 MW of energy that would be produced under that alternative. **F2-06**
>
> Modify turbine placement and/or the number of turbines under Alternative 1 to further reduce impacts to waters and human receptors, e.g., by avoiding placement in washes and on private land. Figure 4.17-3 indicates that at least 3 turbines would be placed in washes of up to 7 feet in width and that one turbine would be placed on private land. Alternatively, consider selection of either Alternative 2 or Alternative 3. **F2-07**

Water Resources

Clean Water Act (CWA) Section 404 Jurisdictional Determination
The DEIS states that a formal jurisdictional delineation identified areas under the jurisdiction of both the U.S. Army Corps of Engineers (ACOE) and the California Department of Fish and Game (CDFG) throughout the study area. ACOE jurisdictional non-wetland Waters of the U.S. total 239.46 acres, with no ACOE jurisdictional wetlands occurring. The DEIS indicates that the applicant made design changes to the proposed Project to minimize impacts to jurisdictional areas. The redesign resulted in a decrease of temporary and permanent impacts to the jurisdictional areas from 239.46 acres to 5.57 acres for Alternative 1, 5.31acres for Alternative 2, and 3.61 acres for Alternative 3.

According to the DEIS, it is anticipated that the project would need to obtain an Individual Permit from the ACOE in accordance with Section 404 of the Clean Water Act. The Applicant submitted applications to the ACOE and RWQCB in May 2011(p.4.17-7).

If an individual Section 404 permit is required, EPA will review the proposed Project for compliance with the Federal Guidelines for Specification of Disposal Sites for Dredged or Fill Materials (40 CFR 230), promulgated pursuant to Section 404(b)(1) of the CWA (Guidelines). Pursuant to the Guidelines, any permitted discharge into waters must be the Least Environmentally Damaging Practicable Alternative (LEDPA) available to achieve the project purpose. No discharge can be permitted if it will cause or contribute to significant degradation of waters. **F2-08**

Based on the information provided in the DEIS, it appears Alternative 3 may be the least environmentally damaging practicable alternative. Three-MW turbines are currently being utilized as a wind energy source nationally, therefore, as required by the 404(b)(1) Guidelines, the applicant must demonstrate the use of these turbines is not technically feasible in order to eliminate this alternative from further consideration. **F2-09**

Recommendations:

EPA recommends that the FEIS include the findings of the ACOEs' verified jurisdictional delineation. **F2-10**

Include, in the FEIS, compensatory mitigation measures for potential unavoidable impacts to waters, as appropriate, pursuant to the Compensatory Mitigation for the Loss of Aquatic Resources Final Rule, 33CFR 325 and 332, April 10, 2008. **F2-11**

Include, in the FEIS and ROD, the Jurisdictional Mitigation Plan. **F2-12**

The FEIS should identify the LEDPA, if applicable, and describe how the proposed Project would comply with the 404(b)(1) Guidelines. The location of ephemeral waters, emergent wetlands, and other sensitive habitat and species should be considered during development of the LEDPA. **F2-13**

Natural Washes

Surface water features in the proposed OWEF area are ephemeral drainages (p. 3.20-5). Several named, dry desert washes cut through the proposed OWEF site and run generally from west to east: Palm Canyon Wash cuts through the center of Site 1; Myer Creek Wash cuts through the southern portion of Site 1; a portion of Coyote Wash cuts through the northwest portion of Site 2; and several additional unnamed washes cut through proposed OWEF site (p. 3.18-2).

EPA is concerned with the scope of indirect and direct impacts to natural washes and site hydrology. According to Figure 4.17-3, there are a number of proposed turbines that will be placed in ACOE and CDFG jurisdictional waters with widths of less than 8 feet. The DEIS provides minimal information on the direct and indirect impacts to these resources as a result of **F2-14** the proposed Project and fails to consider the up- and downstream reach and extent of these aquatic features or their importance in this landscape. **F2-14 cont**

Natural washes perform a diversity of hydrologic, biochemical, and geochemical functions that directly affect the integrity and functional condition of higher-order waters downstream. Healthy ephemeral waters with characteristic plant communities control rates of sediment deposition and dissipate the energy associated with flood flows. Ephemeral washes also provide habitat for breeding, shelter, foraging, and movement of wildlife. Many plant populations are dependent on these aquatic ecosystems and adapted to their unique conditions. The potential damage that could result from disturbance of flat-bottomed washes includes alterations to the hydrological functions that natural channels provide in arid ecosystems, such as adequate capacity for flood control, energy dissipation, and sediment movement; as well as impacts to valuable habitat for desert species.

Recommendations:
The FEIS should assess to impacts to function and acreage of all aquatic resources as a result of the proposed Project. **F2-15**

Avoid placement of turbines and other structures in washes. **F2-16**

Floodplain hazards
Executive Order 11988 Floodplain Management requires federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of floodplains. Per the Flood Insurance Rate Map (FIRM), 06025C1975C IMPERIAL CO UNINC & INC AREAS 09/26/2008, portions of the project are in a Zone A flood zone. The FIRM #06025C1976C, Panel 1976 of 2300 (FEMA, 2008) indicates that there is a Flood Hazard Area surrounding Myer Creek and Coyote Wash. Figure 3.20-2 (FEMA-Designated Flood Hazard Areas) shows that several Flood Hazard Areas run in an east-west direction through Site 1, and a small portion of Flood Hazard Area runs in a north-south direction through part of Site 2 (p. 3.20-4). According to the DEIS, Palm Canyon Wash and Lava Flow Wash, as well as various smaller washes, run through the proposed Project site, and signs of previous flooding events indicate that the potential for flash flooding exists during major storm events.

Recommendations:
The FEIS should discuss any impacts that the proposed Project may have on the potential for flooding, as well as the impacts of potential flooding on the proposed Project. **F2-17**

The FEIS should provide a detailed description of the current FEMA floodplain. **F2-18**

The results of consultation with FEMA, if appropriate, should be included in the FEIS. **F2-19**

Groundwater
The DEIS indicates that the OWEF site lies on top of the Ocotillo-Coyote Wells sole source aquifer (SSA), which is in long-term overdraft condition. The applicant states that it will not use water from this aquifer, but, instead, proposes to purchase all of the water needed for

construction of the turbine foundations, road maintenance, and dust suppression from a private well. The private well draws its water from the Campo-Cottonwood SSA (Pine Valley, CA), which is not presumed to be in a state of overdraft.

Under provisions Section 1424(e) of the Safe Drinking Water Act, EPA is responsible for reviewing and commenting on projects that receive federal funding and are located in recharge areas that have received a Sole Source Aquifer Designation. On August 30, 2011, EPA received an EPA SSA questionnaire, project description, and project maps from Pattern Energy for review of the OWEF project under the Sole Source Aquifer program. Based on the DEIS and documents received, EPA has determined that the proposed Project will not adversely affect the Ocotillo-Coyote Wells sole source aquifer and, in general, as indicated in the DEIS, so long as BMPs and mitigation measures are properly implemented and adhered to, all adverse impacts to water resources would be avoided or substantially reduced. **F2-20**

Recommendations:

The FEIS should confirm the availability of an adequate water supply for construction and operations of the proposed Project and fully evaluate the environmental impacts associated with the ultimately proposed supply of water. **F2-21**

The DEIS includes, as mitigation measures, the development of a Groundwater Monitoring and Reporting Plan, a Drought Management Plan, a Water Supply and Contingency Plan, and a Water Conservation Education Program. These plans and program should be included in the FEIS and ROD. **F2-22**

Clarify in the FEIS, whether the Groundwater Monitoring and Reporting Plan (Mitigation Measure Water-3) is for the Ocotillo- Coyote Wells SSA, Campo-Cottonwood SSA, or both. **F2-23**

Regarding the septic system and leach field, the DEIS indicates that it will be pumped regularly and waste will be trucked offsite. It is unclear if this is just the tank sludge or sanitary waste. Since this statement is somewhat ambiguous, there should be clearer description included in the FEIS with regard to how sanitary waste will be managed. **F2-24**

Desert Pavement

The DEIS states that extensive patches of desert pavement exist on the proposed OWEF site, and acknowledges that the pavement protects the land beneath it from wind and water erosion, forming geologically stable areas (p. 3.4-3). Desert pavement is a distinctive feature widespread across arid lands. It plays a fundamental role in the long-term evolution of the land surfaces it covers and takes thousands of years to form. Damage to desert pavement could result in acceleration of erosion.

Recommendations:

Develop a plan for identification and avoidance or protection of sensitive desert pavement. **F2-25**

Avoid or minimize grading for new access roads or work areas in areas covered by desert pavement. **F2-26**

Consider protecting desert pavement surfaces from damage or disturbance from construction vehicles by use of temporary mats on the surface. **F2-27**

Biological Resources- Endangered Species and Other Species of Concern

EPA is concerned about potential impacts to sensitive wildlife species, since the proposed OWEF area supports resident and migratory birds, mammals, reptiles, and their supporting habitats, including golden eagles, burrowing owls, peninsular bighorn sheep, flat-tailed horned lizards, American badgers, and bat species.

Recommendation:
Describe, in the FEIS and ROD, all biological resources mitigation commitments and how they will be funded and implemented. **F2-28**

Migratory Birds and Bats

The DEIS states that, of the raptor species detected in the OWEF area, red-tailed hawks, turkey vultures, American kestrels and prairie falcons had the highest encounter rates. Based solely on the encounter rates, these species would have the highest risk of collision. In addition, other raptor species such as burrowing owls were detected in the project area. The DEIS does not address nocturnal avian migration and whether surveys were conducted. The DEIS indicated that the applicant is working with FWS in developing an Avian and Bat Protection Plan which will deal with mitigation requirements and adaptive techniques to minimize impacts to avian and bat species **F2-29**

Recommendations:
Include a copy of the Avian and Bat Protection Plan in the FEIS and ROD. The Plan should describe how mortalities of red-tailed hawks and other avian species will be assessed and evaluated for compliance with the Migratory Bird Treaty Act. **F2-30**

Conduct nocturnal avian surveys to account for avian species that migrate at night and incorporate the results in risk assessment, siting, mitigation and avoidance measures. **F2-31**

Elaborate on the proposed Advanced Biological Operations Command and Control Center. Factors to consider include: **F2-32**

- Discuss its limitations, including how weather will affect its performance;
- Include contingency plans in the event of technical or mechanical failure;
- Include results from other projects that have used this approach;
- The DEIS states that the ABOCC will be operational for 3 years with a possible 2 year extension. The DEIS should discuss how eagles will be dealt with after this time expires;

- Discuss whether there will be a curtailment of the operating turbines when other raptors species such as red-tailed hawks fly in the OWEF site;
- The DEIS states that the command center will be used for both avian and bighorn sheep monitoring. Describe the different methods and protocols for bighorn sheep monitoring and how this will affect avian monitoring.

F2-32 cont

Bats

According to the U.S. Geological Survey (USGS), bat fatalities have been documented at nearly every wind facility in North America where adequate surveys for bats have been conducted, and several of these sites are estimated to cause the deaths of thousands of bats per year. The DEIS indicates that five bat species were identified in the proposed OWEF site. Most bat activity was located along the western edge and along the perimeter of the proposed OWEF site. The DEIS concludes that bat use of the OWEF area is relatively low, due to the lack of standing water, prey availability and roosting habitats.

The DEIS states that very little mining has been done around the proposed OWEF site that would result in the kind of abandoned mines that support bat populations. However, as noted in the DEIS, Sugarloaf Mine and a sand and gravel surface mine (the Ocotillo Plant) are located on the project site, and numerous open and closed mines are within two miles of the proposed wind turbines (p. 3.6-3). There DEIS does not explain why these mines are not appropriate roosting sites for the known bat species recorded in the area. F2-33

The DEIS acknowledges that bats are known to fly distances of more than 25 miles from a roost site, but concludes that they typically do so in search of abundant foraging opportunities or water resources, and both of these are generally lacking within the proposed OWEF site (p. 23-18). However, as stated in the DEIS, detention/retention basins shall be installed to reduce local increases in runoff, and drainage from impervious surfaces shall be directed to a common drainage basin (p.4.19-58). We are concerned that these basins may provide a water source for bats attracting them to the OWEF site. F2-34

Recommendations:

The FEIS should explain why the mines located on or near the proposed OWEF site are not suitable roosting sites for bats found in the area. F2-35

The FEIS should describe avoidance measures to deter bats from roosting in the additional man-made structures. F2-36

Incorporate design features for proposed detention basins (e.g. pond netting, fencing) and commit to regular inspection and maintenance to ensure proper protection of bats, birds, and wildlife. F2-37

California Condor

The California condor (*Gymnogyps californianus*) is a federally- and State-listed endangered species, as well as a State Fully Protected species. The condor is not known to commonly occur in Imperial County, and the proposed Ocotillo Wind Energy Facility site is not within the current range of this species (p. 3.23-14); however, this species has the potential to fly over the proposed F2-38

Project site. The San Diego Zoo Institute for Conservation Research has re-introduced a California condor population in the Sierra San Pedro Martir Mountains in Baja, approximately 150 miles southwest of the proposed Project. The goal is to establish 20 breeding pairs in hopes that the Baja population will, in time, link to the central California populations.

Condors range widely in their foraging flights and can fly more than 150 miles in a single day, provided there are strong and consistent winds. The type of wind conditions that favor condor flight may be present in the vicinity of the OWEF area. In addition, the DEIS states that the Sunrise Powerlink transmission line and towers will transverse the project area, which may provide perching opportunities and ample structures for roosting.

F2-38 cont

Although, according to the DEIS, no California condors were observed during the raptor migration counts or any other survey conducted for the proposed Project, the potential exists and will increase as the species' population and range expand. Since Ocotillo Express LLC is requesting a minimum of 30-year ROW to construct and operate the OWEF, the FEIS should address this foreseeable presence and possible impacts.

Recommendations:
Include, in the FEIS, the results of any ESA consultation with the FWS regarding the California condor and demonstrate how the project will comply with the MBTA for this species. **F2-39**

Monitor the San Diego Zoo Institute's condor re-introduction efforts in Baja. **F2-40**

Include the condor in the Avian Protection Plan or develop a protection plan that is unique to the condor. **F2-41**

Address the potential for the transmission towers to provide attractive perching and roosting opportunities for the condor. **F2-42**

Golden Eagles
The DEIS states that. based on estimates from two years of on-site raptor migration counts and avian point counts, golden eagle (*Aquila chrysaetos*) use of the proposed OWEF site is relatively low, especially compared with other projects in California, but acknowledges that golden eagle count information for other projects in the vicinity was not available between 2009 and 2011 for comparison to the data collected for the OWEF project site (p. 4.21-6). Nesting surveys were conducted in 2010 in which 21 golden eagle nests were observed that accounted for five golden eagle territories within ten miles of the OWEF site, two of which were considered active territories in 2010. However, the DEIS fails to mention how close any of the nests were to the proposed OWEF turbine strings. **F2-43**

The DEIS indicated that the applicant is working with the FWS in developing an Eagle Conservation Plan which will deal with mitigation requirements and adaptive techniques to minimize impacts to golden eagles.

Recommendations:
The FEIS should:

Elaborate on risk assessment methods and how seasonal, prey, biotic variations and uncertainty of accurate golden eagle numbers and use were accounted for. **F2-44**

Include the nest distances from the OWEF area and specifically to proposed turbine strings. **F2-45**

Include the Eagle Conservation Plan in the FEIS and ROD. **F2-46**

Discuss the applicability of the recently finalized U.S. Fish and Wildlife Service (FWS) permit regulations (50 CFR Parts 13 and 22) to the proposed Project.[1] Elaborate on the process and likelihood of obtaining a permit via these regulations. **F2-47**

Cultural Resources and Coordination with Tribal Governments

Executive Order 13175, ***Consultation and Coordination with Indian Tribal Governments*** (November 6, 2000), was issued in order to establish regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, and to strengthen the United States government-to-government relationships with Indian tribes. The DEIS states that BLM's government-to-government consultation with Native American Tribes is ongoing, and the cultural resource surveys have not been completed. Several proposed utility-scale renewable energy projects in California are currently the subject of lawsuits pertaining to tribal cultural resources. We urge BLM to ensure that government-to-government consultations are being conducted in a manner that is meaningful to the Tribes that would be affected by the proposed Project. **F2-48**

Section 106 of the National Historic Preservation Act requires Federal agencies to consider the effects of their actions on cultural resources, following regulations at 36 CFR 800. Consultation for tribal cultural resources is required under NHPA Section 106, which requires a federal agency, upon determining that activities under its control could affect historic properties, to consult with the appropriate State Historic Preservation Officer/Tribal Historic Preservation Officer (SHPO/THPO). Under NEPA, any impacts to tribal, cultural, or other treaty resources, and possible measures to mitigate such impacts, must be discussed in the EIS. **F2-49**

Through the consultation process, some of the concerns expressed by the tribes include: the project site is a relatively pristine location with a high density of prehistoric resources that should be considered as a whole cultural landscape or district; potential effects on the archaeological and known cremation sites; and the potential for additional unknown cremation/burial sites, which may be located within the project area but are as yet undiscovered. In addition, tribes have indicated that certain geological features - including Coyote Mountain, which is outside the ROW but near the project site, and the Spoked Wheel Geoglyph within the ROW - hold **F2-50** significant value. The tribes have also expressed strong concerns to the BLM over the potential for indirect impacts from the project to cultural resources through the creation of additional access roads into the area that could be used by off-road enthusiasts (ES p. 17). **F2-50 cont**

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[1] See Eagle Permits, 50 CFR parts 13 and 22, issued Sept. 11, 2009. See internet address: http://www.fws.gov/migratorybirds/CurrentBirdIssues/BaldEagle/Final%20Disturbance%20Rule%209%20Sept%202009.pdf

The applicant intends to develop a Cultural Resource Monitoring and Mitigation Plan prior to the start of construction.

Recommendations:
Discuss, in the FEIS, how these concerns raised by Tribes were addressed and resolved. **F2-51**

The FEIS should address Executive Order 13007, distinguish it from Section 106 of the NHPA, and discuss how the BLM will avoid adversely affecting the physical integrity, accessibility, or use of sacred sites. **F2-52**

Include the Cultural Resource Monitoring and Mitigation Plan and the results of the cultural resource surveys in the FEIS and ROD. **F2-53**

Cumulative Impacts Analysis

Cumulative impacts are defined in the Council on Environmental Quality's (CEQ) NEPA regulations as "the impact on the environment that results from the incremental impact of the action when added to the other past, present, and reasonable foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR Part 1508.7)". The proposed Sunrise Powerlink (SRPL) 500 kV Transmission Line Project (SRPL) would transverse the proposed OWEF site from northeast to the southwest and may be in close proximity to the WTGs turbines, switchyard, and collector substation. The DEIS states that this project is under construction and will continue into 2012 and will not overlap with the construction of the OWEF. We note that the SRPL recently experienced a temporary delay. The potential for further delays give rise to the possibility that the construction phases of the two projects could overlap. **F2-54**

In addition, Figure 2.1-2 shows an existing transmission line, the Southwest Powerlink, paralleling the proposed SRPL, but its contribution to the cumulative impacts is not mentioned in the DEIS. **F2-55**

Recommendations:
The FEIS should expand on the SRPL's transmission capacity and whether it would utilize any components of the proposed Project (including transmission towers, access roads, etc). Given the proposed Sunrise Powerlink's close proximity to the proposed Project, and the potential for delay in the Powerlink's construction schedule, the FEIS should include a specific detailed cumulative impact analysis regarding the two projects. Topics such as increased transmission towers and lines, access roads, disturbance to vegetation and wildlife, increased fire risk and aquatic resource impacts should be included. **F2-56**

The FEIS should also discuss the existing Southwest Powerlink transmission line and its contribution to the cumulative impacts. **F2-57**

The FEIS should propose mitigation for all cumulative impacts, and clearly state the lead agency's mitigation responsibilities and the mitigation responsibilities of other entities. **F2-58**

__Air Quality__

According to the DEIS, one residence is located within the project boundary on the private lands leased by the applicant; this residence is not considered a sensitive receptor as the owner has accepted the construction and operation of the project as part of the agreement to lease lands to the applicant (Construction AR-4, pp. 4.2-6&7 4.2.3.2). While we acknowledge the agreement, EPA encourages BLM to disclose the potential impacts to the residence in the FEIS and to minimize those impacts. **F2-59**

Mitigation Measure AIR-2 states that off-road construction diesel engines not registered under California Air Resources Board's Statewide Portable Equipment Registration Program, which have a rating of 50 horsepower to 750 horsepower, shall meet, at a minimum, the Tier 3 California Emission Standards for Off-road Compression-Ignition Engines as specified in California Code of Regulations, Title 13, section 2423(b)(1) (p. 4.2-22 -). EPA recommends that a Tier 4 engine be used to minimize air quality impacts. **F2-60**

__Completion of Surveys and Plans__

The DEIS states that the Banded Gecko and Burrowing Owl surveys and several plans were not completed before publication. Some of these include: Habitat Restoration and Revegetation Plan, Cultural Resource Management Plan, Hazardous Materials Management Plan, Raven Control Plan, Integrated Weed Management Plan and Fire Safety Plan

Recommendations:
The results of surveys that are needed to complete the development of appropriate avoidance and mitigation measures to minimize impacts to various resources should be included in the FEIS. **F2-61**

The missing plans should be completed and included in the FEIS and ROD. **F2-62**

-----Original Message-----
From: Karen_Washington@nps.gov [mailto:Karen_Washington@nps.gov] On Behalf Of PWR_Regional_Director@nps.gov
Sent: Thursday, October 06, 2011 2:28 PM
To: Cedric_Perry@ca.blm.gov
Cc: Torres, Naomi; Sauvajot, Ray; Schmierer, Alan C.; Lee, Martha; Ross, Steven D.
Subject: DES\11-0020 Comments Regarding Proposed Ocotillo Wind Energy Facility - Impacts to Anza National Historic Trail

F3-01

OFFICIAL CORRESPONDENCE BY ELECTRONIC MAIL
NO HARD COPY TO FOLLOW

US DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
Pacific West Regional Office
333 Bush Street, Suite 500
San Francisco, California, 94104-2828

L7619 (PWR-PP)

October 6, 2011

Cedric Perry, Project Manager
California Desert District
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22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
Cedric_Perry@ca.blm.gov

Re: DES\11-0020 Comments Regarding Proposed Ocotillo Wind Energy Facility - Impacts to Anza National Historic Trail

Dear Mr. Perry:

The National Park Service appreciates the opportunity to review the Draft Environmental Impact Statement (DEIS) prepared for the proposed Ocotillo Wind Energy Facility (OWEF) in Imperial County, California. Our comments primarily address potential impacts to, and mitigation for, the Juan Bautista de Anza National Historic Trail, due to our responsibility to administer, coordinate, preserve and enhance this component of the National Trails System.

The National Park Service (NPS) has a special interest in ensuring the protection of the Juan Bautista de Anza National Historic Trail. Congress, under the National Trails System Act ([NTSA], 16 USC 1241 et. seq.), established the Juan Bautista de Anza National Historic Trail (Anza NHT) in 1990. The Act states that "National historic trails shall have as their purpose the identification and protection of the historic route and its historic remnants and artifacts for public use and enjoyment." NPS as Administrator of the Anza NHT is charged with implementing this vision in collaboration with other federal, state, and local agency partners such as the Bureau of Land Management (BLM).

The project site is located in the Yuha Desert approximately 8 miles west of the mapped historic corridor traveled by the Anza expedition, and the Anza recreation trail is located approximately 3 miles from the southeast corner of the site, as shown on DEIS Figure 3.13-1. This area is one of the least disturbed landscapes along the entire 1,200 mile length of the Anza NHT. As such, the historic trail corridor near the project site retains the integrity to convey historic interpretation and appreciation of the Anza expedition. NPS has special concerns regarding the OWEF due the scale of the wind turbines and the project's potential to significantly disturb the relatively intact character of the landscape.

The Juan Bautista de Anza National Historic Trail Comprehensive Management and Use Plan and Final EIS, April 1996 (Anza CMP) documents that the trail corridor within the Yuha Desert a designated High Potential Route Segment.
This segment of the Anza NHT is considered a Federal protection component because it is located on federally owned lands and it meets the national historic trail significance criteria established in the NTSA. The segment includes two historic expedition campsites (Camp #48, at Coyote Wash, and Camp #47, Yuha Well/California Registered Historical Landmark No. 1008).
Also, the Vista de Anza Historical Monument, located along the Anza recreation trail near Highway 98, is near a modern designated campsite, and provides expansive views of the Yuha Desert, including Yuha Well, and the project site. The Anza Recreational Trail is mapped and identified by BLM through signs on designated routes-of-travel in the Yuha Desert ACEC off Highway 98 and also north of I-8 to Plaster City and San Sebastian Marsh.

Installing large wind turbines and related support facilities would significantly alter viewsheds in the surrounding area, including views from the historic Anza historic corridor and the Anza recreational trail. The undertaking thus has the potential to degrade the integrity historic character of the trail and its related resources in this area. The Project as currently proposed also has the potential to diminish the public's experience and understanding of the historic expedition and the cultural landscape of that period. **F3-01**

Characterization of the Anza NHT
We do not feel that the DEIS adequately characterizes the Anza NHT nor fully discloses the significance of the proposal's potential effects on the Anza NHT. These are only briefly described in Section 4.15 Special Designations, and no specific impacts nor mitigation are identified specific to the Anza NHT. We are also concerned that the DEIS does not adequately specify the mitigation needed to avoid or reduce the project's impacts to the Anza NHT. **F3-02**

The analysis in the DEIS does not recognize the project's proximity to the Anza Recreation Trail, which begins at Highway 98 approximately 3 miles east of Site 2. The few references to the Anza NHT appear to only reference the historic corridor traveled by the expedition, which may be as close as 6 miles east of the Site 2. Therefore, impacts to the Anza NHT, where discussed, are understated. **F3-03**

Visual Resources
The analysis of the project site viewshed should be extended to 40 miles, and the impact assessment should be extended to 25 miles. In turn, this expansion may indicate that the OWEF is visible from additional segments of the Anza NHT. **F3-04**

The Anza NHT is substantially farther from the project site than any of the existing simulations, so the existing simulations are inaccurate approximations of how the project would be seen. The visual **F3-05** simulation from KOP 8, from Highway 8 near Nomirage, is the closest simulation to the Anza recreation trail and presently must be interpreted to represent the kind of views that Anza NHT visitors might experience when traveling to or from the Anza Recreation Trail. Views of the OWEF turbines from the trail would be more distant but would still be drastically altered. NPS requests that a visual analysis of impacts from the Anza recreation trail be conducted and included in the Final EIS. A similar analysis was prepared in consultation with NPS for the Imperial Valley Solar project. F3-06

Further, the DEIS states that the project would include implementation of recommended BMPs specified in BLM's Programmatic EIS for Wind Energy Development on BLM-Administered Lands in the Western United States. One of those BMPs (bullet #5) states: F3-07

> When any ROW application includes remnants of a National Historic Trail, is located within the viewshed of a National Historic Trail's designated centerline, or includes or is within the viewshed of a trail eligible for listing on the NRHP, the operator shall evaluate the potential visual impacts of the proposed project and identify appropriate mitigation measures for inclusion as stipulations in the POD. (DEIS p.4.4-24.)

Although the project site is within the viewshed of the Anza NHT (historic corridor and recreation trail), a visual analysis of views from the trail has not been conducted as part of the DEIS. NPS formally requests that the Final EIS include an analysis of the visual impacts to the trail, and that mitigation be stipulated to offset the project's impacts. F3-08

The DEIS erroneously asserts that the project is not required to meet the interim VRM Class Objectives. The visual contrast ratings in the DEIS determined the proposed development will not meet the Interim Class III objectives that have been assigned to the project area. The visual impacts of the project must either be mitigated to bring it into conformance with the Interim VRM Objectives, or the Interim VRM Class Objectives must be changed through a CDCA plan amendment. F3-09

Cultural Resources

The Cultural Resources analysis briefly identifies the Anza expedition's place in history and discusses its relationship to the site. However, DEIS page 3.4-7 includes a confusing statement: "The exact current location of the Anza Trail in this area has not been clearly established." We wish to clarify that the historic corridor through the project site is an inferred alignment based on historic journals and maps. Identifying the exact alignment of the historic route through the Yuha desert is nearly impossible because the two Anza Expeditions and subsequent Spanish parties traveled on foot and horseback, and did not leave permanent settlements behind. However, based on our records it can be inferred that the Anza party did not cross the project site. The Final EIS should also clarify that the exact location of the present-day Anza recreation trail is mapped and signed by BLM. F3-10

Recreation

With the exception of the reference on page 3.13-3 the Recreation analysis does not specifically discuss the Anza NHT as a recreational resource, nor does it identify impacts to the Anza NHT. There is no analysis of impacts to the Anza NHT as a recreational resource. This discussion seems to be limited to Section 4.16, Special Designations. This omission should be clarified, or at least cross-referenced with the discussion in Section 4.16. F3-11

NPS requests that this omission be addressed in the Final EIS and that appropriate mitigation be included. At a minimum, NPS recommends that the alignment of the Anza Recreational Trail in the vicinity of the project be re-evaluated to consider an alignment away from industrial scale energy facilities to avoid impacts to the recreational users. Refer to the end of this letter for a more detailed discussion of suggested mitigation to address this impact.

Alternatives

Alterations to the project design as proposed by the Build Alternatives (Alternative 2 and 3) would not significantly lessen impacts to the Anza NHT due to the scale and visual impacts of the project. However, Alternative 3, which would eliminate Site 2 from the project, would increase the project's distance from the Anza NHT. Given the relatively untouched character of the landscape, and the high quality recreation lands that are already preserved in the area, we would prefer to see Alternative 4 (No Action) adopted, because it would not result in the granting of a right-of-way for the project, nor would it amend the California Desert Conservation Plan (CDCA) to allow the area to be converted into an industrial scale renewable energy area. **F3-12**

Furthermore, approval of the Proposed Action (Alternative 1), or any project alternative other than Alternative 4, could encourage approval of additional projects in the vicinity by signaling that the area is destined to become a renewable energy production zone, resulting in unacceptable cumulative impacts to the Anza NHT. These would derive from further installation of infrastructure capable of supporting additional energy generation facilities, changing land use of the area to one of energy generation, in turn degrading the existing landscape such that future projects could be considered a less dramatic change to existing conditions. **F3-13**

NPS prefers alternatives that would locate industrial scale renewable energy projects within or adjacent to existing disturbed lands, either in Imperial County, or closer to metropolitan areas that would consume the energy generated by the project. The merits of such alternatives need to be fully examined in the Final EIS. Locating the wind or solar projects on or near existing agricultural or urbanized areas would avoid or minimize impacts to the natural landscape. **F3-14**

Cumulative Impacts

The DEIS Cumulative Impacts analysis identifies many other past, present, or future projects that could impact the Anza NHT, and the California desert as a whole. This includes the Imperial Valley Solar Project near Plaster City, which was approved, then litigated, and is now being revised by a new owner. The analysis does not identify projects underway or anticipated in Arizona near the Anza NHT alignment (primarily between Gila Bend and Yuma) that could synergize the cumulative impacts (i.e. cultural, visual, noise, recreational) and further degrade the integrity of the trail. As a result, the cumulative impact analysis should to be expanded in the Final EIS to include all projects which could directly or indirectly affect the Anza NHT corridor. **F3-15**

However, the cumulative impact analysis does suggest that implementation of the proposal, and other energy projects, would result in significant impacts to many environmental resources in the California desert and elsewhere in the west. The result will be profound changes to the visitor's experience in these areas. NPS is very concerned about the implications of these long term changes. To ensure that projects are sited in appropriate locations using appropriate technologies to avoid impacts to our nation's natural and cultural heritage, it is imperative that landscape level analyses be conducted to fully evaluate the implications of the widespread deployment of renewable energy projects, and their associated support facilities, on the public lands. We recommend that the Final EIS include a section discussing this aspect of cumulative impacts and efforts underway by the BLM to address landscape level concerns. **F3-16**

Mitigation Strategy Proposed by NPS

The following suite of potential mitigation measures is proposed by NPS to ameliorate the potential effects of the proposal on the Anza NHT. This mitigation strategy is similar to that suggested by NPS for **F3-17** the Imperial Valley Solar Project. Implementing these mitigation measures would provide enhancements to the Anza NHT in the vicinity of the project site through improved interpretation and recreation services. We recommend that the mitigation measures be finalized through an Interpretive Plan for the area.

NPS has had preliminary discussions with BLM staff regarding these proposed mitigation measures. Should this project be approved, the NPS realizes that more in-depth discussions with BLM and the project applicant are needed before proceeding, and the final mitigation measures would be more carefully evaluated and refined in the context of the Anza NHT Interpretive Plan.

Interpretive Plan for Anza NHT within El Centro Field Office Territory We recommend that the NPS (or BLM in consultation with NPS) prepare an Interpretive Plan for the Anza NHT in western Imperial and San Diego Counties. The plan would identify the existing interpretive sites in the area and make specific recommendations for expanding the interpretation of the Anza Trail in the area. Mitigation measures to address in the plan include the following:

F3-17 cont

New Interpretive Facilities

Design, fabricate, and install new interpretive facilities throughout the area, including:

1. Installation of Yuha Well wayside exhibit. The BLM has designed an interpretive panel for Yuha Well, but has not yet constructed a permanent kiosk for the panel. Due to the significance of Yuha Well as a critical Anza campsite location, and the more modern historical resources that are extant at the site, installation of a permanent interpretive exhibit is considered a top priority.
2. Additional Interpretation at Anza Overlook. The Anza Overlook, located along the Anza Recreational Trail near Highway 98, contains a large stone monument and plaque placed by BLM in 1990. The site, which is also near a designated camping area and the Yuha Geoglyphs, affords spectacular views of the Yuha Desert. Additional interpretive exhibits at this location, or at the existing kiosk near the Highway 98 turnoff for the Overlook & Anza Recreational Trail (dirt road EC-274), would serve many area visitors and foster more insights into the story of the Anza expedition.
3. Install Interpretive exhibit at Plaster City OHV Staging Area. The Plaster City OHV area is a busy off road vehicle area with over 20,000 vehicles per year. The Plaster City OHV staging area is located just west of Plaster City off Evan Hewes Highway. Installation of an interpretive facility at this location would connect with the many OHV visitors to the area and provide more insight to the story of the Anza expedition. The historic Anza expedition Campsite #48 is within the OHV area, and is identified as an interpretive site in the Anza NHT management plan.
4. Supplement exhibit at Sunbeam Rest Area on I-8. The Sunbeam Rest Area, located between Forrester & Drew Roads, six miles west of El Centro, was recently renovated by Caltrans. New interpretive panels at the rest area mention the Anza expedition in the context of other early Spanish explorers. The rest area also contains a State historic monument with misleading text that refers to the rest area as the site of Yuha Well. There may be an opportunity to provide supplemental information about the Anza Expedition at the rest area and to correct the record and reach the many visitors who use the facility.

Museum Exhibit

Install an Anza-themed exhibit at a local museum. The recently constructed Imperial Valley College Desert Museum in the town of Ocotillo sits vacant due to the college's lack of funds to install exhibits and to staff the museum. The BLM-El Centro Field Office has a collection of Native American artifacts that need to be properly archived, and this vacant museum was planned as a repository for the collection. Due to its proximity to the project site, the vacant museum building would be a good venue to provide interpretation of the Anza expedition, and would be complementary to the original themes planned for the museum, archaeology and natural resources.

The town of Ocotillo is the southwestern access point off Interstate 8 for the Anza-Borrego State Park and the Yuha Desert, and is a good location to connect with visitors and increase tourism to these areas. Additional subjects at the museum could include solar energy technology, the Jacumba Mountains Wilderness and Anza-Borrego State Park. An alternative museum for interpretation of the Anza NHT could be the Imperial Valley Pioneer Museum in Imperial, CA.

Anza NHT Interpretive Brochure

Prepare an interpretive brochure specific to western Imperial and San Diego Counties which describes the Anza Trail and the expeditions' experience through the area.

Increase Accessibility of BLM's Yuha Desert Cultural History Audio Tour In 2010 the BLM completed an excellent audio tour of the Yuha Desert that interprets the Anza expedition and other cultural history, and discusses Yuha Well, the Anza Overlook, and the nearby Geoglyphs. Currently the audio tour is available as a downloadable podcast (http://www.blm.gov/ca/st/en/fo/elcentro/arch_cult/yuha_pc.html) and on CDs distributed from BLM's El Centro office in early 2010. The BLM's audio tour of the Yuha Desert could be made more accessible to visitors to the desert by implementing a phone-in tour or by broadcasting it via low-power radio. Visitors would be notified of the tour through signage at the interpretive sites. The audio tour could also be expanded to discuss other important resources or subjects in the area, such as San Sebastian Marsh, Native American tribes, and even modern uses of the desert, such as the proposed solar project.

Re-evaluate the Alignment and Improve the Anza Recreational Trail The Anza Recreational Trail currently extends east of the project site from Highway 98 to I-8 and Dunaway Road toward the Anza Overlook, and north of the project site from Plaster City along the U.S. Gypsum rail line. Due to the impacts of this and other industrial scale renewable energy projects in the area, the trail's existing and planned alignment in this portion of the desert should be re-evaluated. An alternative alignment to more distant and/or shielded terrain should be implemented if it would substantially improve the recreational experience on the trail by minimizing impacts from the proposed project and other cumulative impacts. If the relocated trail route were to cross private property, access easements would need to be obtained. The cost of acquiring such easements could be a mitigation measure required of the project applicant.

Historic Campsite Surveys

Fund the preparation of archaeological studies of the Anza Expedition campsites. The historic campsites #47 (Yuha Well) and #48 (north of Plaster City near Coyote Wash), are south and north of the project site, and have not had formal archaeological studies to identify historic artifacts left by the Anza expedition. It should be noted that previous archaeological studies of campsite #49, (San Sebastian Marsh) have identified Spanish artifacts. The Anza CMP calls for NPS to survey campsite locations and prepare record forms for listing on the National Register of Historic Places.

Trail-wide Mitigation Fund

Contribute a fee, in an amount to be determined, to a mitigation fund for trail-wide projects (in addition to those listed above, and not tied to immediate vicinity of project site), that the Anza NHT Superintendent would have discretion to allocate for high priority projects anywhere along the Anza NHT.

CONCLUSION

The mitigation strategy we have outlined is conceptual in nature, and our comments are intended to foster additional collaborative discussions with the BLM and project applicant. **F3-18**

For any clarification of our comments on the DEIS or for further information relevant to the preparation of an Interpretive Plan, please contact Naomi Torres, Superintendent, Anza NHT (415) 623-2340 (Naomi_torres@nps.gov) or Steven Ross, Outdoor Recreation Planner (415) 623-2343 (steven_ross@nps.gov).

Sincerely,

/s/ George J. Turnbull
(signed original on file)

George J. Turnbull
Acting Regional Director, Pacific West Region

cc:
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In Reply Refer To:
FWS/CDFG-IMP-11B0326-11F0519

Cedric Perry, Project Manager
El Centro Field Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, California 92553

Subject: Comments on the Draft Environmental Impact Statement/Environmental Impact Review (EIS/EIR) for the Ocotillo Express Wind Energy Facility, Imperial County, California (CACA 51552), State Clearinghouse No. 2010121055

Dear Mr. Perry:

The U.S. Fish and Wildlife Service (Service) and California Department of Fish and Game (Department), hereafter collectively referred to as the Wildlife Agencies, have reviewed the Draft Environmental Impact Statement/Environmental Impact Report (DEIS/EIR), dated June 2011, for the proposed Ocotillo Express Wind Energy Facility. The proposed project is located at the western border of Imperial County, California, near the town of Ocotillo. The Bureau of Land Management (BLM) proposes to issue a right-of-way (ROW) grant authorizing the construction, operation, and maintenance of the proposed 465 megawatt (MW) project.

The primary concern and mandate of the Service is the protection of public fish and wildlife resources and their habitats. The Service has legal responsibility for the welfare of migratory birds, anadromous fish, and endangered animals and plants occurring in the United States. The Service is also responsible for administering the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*). The Department is a trustee agency under the California Environmental Quality Act (CEQA) and is responsible for ensuring appropriate conservation of fish and wildlife resources including rare, threatened, and endangered plant and animal species, pursuant to the California Endangered Species Act. The Department also acts as a Responsible Agency regarding any discretionary actions (CEQA Guidelines Section 15381), such as the issuance of a Lake or Streambed Alteration Agreement (Fish and Game Code Sections 1600 *et seq.*) and/or a Permit for Incidental Take of Endangered, Threatened, and/or Candidate species (Fish and Game Code Sections 2080 and 2080.1).

Based on our review of the DEIS/EIR, we offer comments on five categories of concern: 1) impacts to the federally endangered Peninsular bighorn sheep (*Ovis canadensis nelsoni*); 2) impacts to streambeds, federally and State-protected waters, and associated sensitive vegetation communities; 3) potential project impacts to Flat tailed horned lizard (*Phryosoma mcallii*) and other sensitive species; 4) potential project impacts on Golden Eagle (*Aquila chrysaetos*) and migratory birds; and 5) general comments on proposed project actions and potential impacts. Our specific comments, concerns, and recommendations are identified in the attached table.

Based on conversations as part of consultation under Section 7 of the Endangered Species Act (16 U.S.C. 1531 *et seq.*), permit issuance in accordance with the Clean Water Act 404 (33 U.S.C. 1344), and planning compensation efforts, the Wildlife Agencies are aware that the applicant has committed to resolve many of the issues described in our comments. However, we wish to ensure that the resolution of these issues is clearly incorporated into the final EIS/EIR.

Thank you for the opportunity to comment on the proposed project. For further information or questions, please contact Nisa Marks (Service) of the Palm Springs Fish and Wildlife Office at 760-322-2070 x208 or Magdalena Rodriguez (Department) of the Inland Deserts Region at 909-945-3294.

Sincerely,

Kennon A. Corey
Assistant Field Supervisor
U.S. Fish and Wildlife Service

for David Elms
Environmental Program Manager
California Department of Fish and Game

Enclosure

cc:
State Clearing House (via fax)
Angelina Havens, Imperial County Planning Department

Standard Review Form
Draft EIS/EIR, Ocotillo Wind Energy Facility

Reviewer's Name: Nisa Marks
Magdalena Rodriguez

Reviewer's Organization: U.S. Fish and Wildlife Service, Region 8
CA Department of Fish and Game, Region 6

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Primary Disciplinary Area (e.g., ecology, land use planning, regulatory oversight): Biology, endangered species, regulatory oversight (ESA, Bald and Golden Eagle Act, Migratory Bird Treaty Act)

Section or Chapter Number and Date of Reviewed Document: July 2011 Public Draft

EIS Section	Page/Line	Comment/Suggested Revision	Action *(for use by ANL)*
2.1.3.1	2-8	Importing material to the project site for road construction may introduce invasive/nonnative plant species to the area. The weed management plan should address where imported soil materials would come from and how imported materials would be screened to minimize the presence of weed seeds. Imported soil borrow should be obtained only from authorized and permitted sites. Should aggregate and/or geosynthetic material be used to reinforce soils, adequate plans need to be in place to account for their removal during road decommissioning. Further, a plan should be in place to minimize potential dispersion of such artificial material in the event of a flood event while the material is exposed (i.e. not paved). The plan should also describe how materials would be gathered if dispersion occurs.	
2.1.3.1	2-8	Please provide additional information on how disturbed areas outside the width of the final roadway would be stabilized. Planting native vegetation would both aid in soil stabilization and jumpstart restoration of project impacted areas.	
2.1.3.1	1-8	Please provide additional information on how topsoil from crane pad excavation would be stored between the time of construction and restoration. Soil storage should follow best management practices to minimize erosion, dust, and soil sterilization (the loss of viability of any native seeds in the soil bank).	

F4-01

F4-02

F4-03

2.1.3.1	2-8	The draft EIS is inconsistent in its treatment of project site fencing. Section 4.21.3.1, Direct and Indirect Impacts to Wildlife Resources of Alternative 1, makes no mention of any fencing being used during construction and explicitly states that the OWEF site would not be fenced during facility operation and maintenance. However, the project description portion of the EIS, Section 2.1.3.1, describes a permanent fence being installed around the substation/utility switchyard, the O&M building, and meteorological towers. Further, it mentions the possibility of temporary security fencing and/or protective fencing around construction areas. The design of any permanent or temporary security fences installed should be decided in coordination with the Wildlife Agencies to ensure the type and height of fencing installed does not harm Peninsular bighorn sheep. Wire fences or even a single strand of wire may kill or harm bighorn sheep. Bighorn rams may easily become entangled, when wire becomes trapped within the curl of their horns. If this happens, the animals frequently panic, fight the strange object, and eventually strangle themselves. Additionally, bighorn sheep have been killed while attempting to crawl under wire fences. Bighorns have crawled through amazingly small gaps along the bottom of wire fences constructed in the Rancho Mirage area of the Coachella Valley of California. Following correct fence specifications should minimize the chances that accidents or entrapments would occur.	
2.1.3.1	2-9	Please clarify the methods that would be used to delineate work areas, including protective fencing. If fencing is used instead of stakes to delineate disturbance boundaries during construction, fencing should be designed in coordination with the Wildlife Agencies to ensure it does not pose a mortality threat to Peninsular bighorn sheep or FTHL. For any protective fencing installed, monitoring to ensure that the fence remains intact and disturbance does not occur outside the fence should be included in the responsibilities of the Biological Monitor(s). Further, monitoring of fenced boundaries to determine impacts on FTHL (e.g. increased predation) should be included as a responsibility of the Biological Monitor(s) in 4.21.10 Mitigation Measure Wild-1d (for construction) and Wild-1u (for ground-disturbing O&M activities).	
2.1.3.1	2-9	Refer to comment above on 2.1.3.1, 2-9. In addition, the extent of invasive/nonnative plant presence at gravel pit sites should be evaluated by a qualified biologist and taken into consideration when selecting a source for gravel fill materials. Gravel should be washed or otherwise controlled for invasive species presence.	

F4-04

F4-05

F4-06

2.1.3.1	2-9	To avoid and minimize impacts to listed and sensitive species, all water associated with the concrete batch plant should be in enclosed containers to prevent the accumulation of free standing water that may attract wildlife, including predator populations, Peninsular bighorn sheep, or protected migratory bird species, that then face increased risk of mortality from project infrastructure or activities.		F4-07
2.1.3.1	2-10	All construction-related waste should be kept in closed containers and disposed of properly. Workers should be informed of the importance of containing all trash. Waste could attract predators, whose increased populations can then have a detrimental impact on sensitive species in the area.		F4-08
2.1.3.2	2-14	The Wildlife Agencies recommend burying the entirety of the transmission line, including the line connecting the utility switchyard to the new 500-kV transmission line. Alternatively, if burying of lines is not feasible, the Wildlife Agencies recommend the use of tubular (monopole) towers to reduce the ability of migratory birds and raptors, including golden eagles, to perch and/or nest on tower structures.		F4-09
2.1.3.2	2-15	Minimizing disturbance areas and preserving the root zones of existing vegetation are critical construction best management practices to minimize construction impacts and facilitate restoration. However, these actions would occur during the construction phase, not after. Consequently, they should not be the "core feature" of the stabilization and restoration plan. Instead, this plan should include actions that can be completed after construction to return the site to ecological function.		F4-10
2.1.3.3	2-15	The statement that all internal access roads built and used during construction would be maintained throughout commercial operations is inconsistent with the statement in 2.1.3.2.11 that all soils disturbed by temporary access roads would be reclaimed. Temporary roads are referred to throughout the EIS, and should be defined. This section should make clear which roads are temporary and which will be maintained and used throughout the project's lifespan.		F4-11
2.1.3.4	2-16	The decommissioning of the Operations and Maintenance (O&M) Facility is included in the bullet list enumerating what would be in the decommissioning plan. Consequently, the sentence that starts "Reclamation includes bonding for the life of the project …" should be modified to include the O&M facility.		F4-12
2.1.3.4	2-16	The mobilization of cranes to each wind turbine site during restoration would result in additional impacts comparable to those associated with crane use during construction. These impacts should be quantified and addressed in the EIS.		F4-13
2.1.3.4	2-16	Impacts to the vegetation community from the presence of an excavator during		F4-14

		decommissioning should be addressed. Issues relating to soil compaction from the use of heavy equipment should also be addressed.	
2.1.3.5	2-19	See comment above for 2.1.3.1, 2-10. The project's Waste Management Plan should address refuse other than construction materials in addition to construction waste.	
2.1.3.5	2-19	Please clarify what is meant by the second bulleted Resource Conservation Measure. Please clarify what surveys would be conducted. Appropriate protocols for wildlife and vegetation resources should be determined in coordination with the Wildlife Agencies.	
2.1.3.5	2-19	The Restoration Plan should reflect the lengthy recovery time of desert ecosystems. Because recovery of vegetation in the desert can take decades or longer, we consider all ground-disturbing impacts associated with the proposed project to be permanent. Vasek *et al.* (1975) found that in the Mojave Desert transmission line construction and O&M activities resulted in a permanently de-vegetated maintenance road, enhanced vegetation along the road edge and between tower sites (often dominated by non-native species), and reduced vegetation cover under the towers, which recovered significantly but not completely in about 33 years. Webb (2002) determined that absent active restoration following extensive disturbance and compaction in the Mojave Desert, soils in this environment could take between 92 and 124 years to recover. Other studies have shown that recovery of plant cover and biomass in the Mojave Desert could require 50 to 300 years in the absence of restoration efforts (Lovich and Bainbridge 1999). Based on a quantitative review of studies evaluating post-disturbance plant recovery and success in the Mojave and Sonoran deserts, Abella (2010) found that reestablishment of perennial shrub cover (to amounts found on undisturbed areas) generally occurs within 100 years but no fewer than 40 years in some situations. He also found that a number of variables likely affect vegetation recovery times, including but not limited, to climate (e.g., precipitation and temperatures), invasion by non-native plant species, and the magnitude and extent of ongoing disturbance. The Restoration Plan should clearly define the difference between temporary and permanent impacts, and clarify how each would be treated during restoration. Permanent impacts should be restored or reclaimed during decommissioning. Literature cited: Abella, S.R. 2010. Disturbance and Plant Succession in the Mojave and Sonoran Deserts of the American Southwest. *International Journal of Environmental Research and Public Health* 7:1248-1284.	

F4-14, cont.

F4-15

F4-16

F4-17

		Lovich J.E. and D. Bainbridge. 1999. Anthropogenic Degradation of the Southern California Desert Ecosystem and Prospects for Natural Recovery and Restoration. *Environmental Management* 24(3):309-326. Vasek, F. C., H. B. Johnson, and D. H. Eslinger. 1975. Effects of pipeline construction on creosote bush scrub vegetation of the Mojave Desert. *Madroño* 23:1-13. Webb, R.H. 2002. Recovery of severely compacted soils in the Mojave Desert, California, USA. *Arid Land Research and Management* 16: 291-305.		**F4-17, cont.**
2.1.3.5	2-19	Whenever possible, the top 10 inches of topsoil should be stockpiled in windrows at the tops of excavation slopes and at the toes of embankment slopes of associated roads. After being placed in windrows, the soil should not be moved again until moved to its final location during restoration. This will allow some plants to regrow, as well as maximize the conservation of soil microflora that aides plant establishment and growth. Soil should be stored for the minimum time possible, to minimize heat kill and associated problems of stockpiling.		**F4-18**
2.1.3.5	2-20	Noxious weeds and invasive species can be transported to the project site due to construction vehicles used off-site, in imported gravel or soil, or other vectors. The first sentence of the bullet point beginning "Develop a plan for control of noxious weeds and invasive species" should be revised to reflect this. A revised sentence could read "Develop a plan for control of noxious weeks and invasive species, which could occur as a result of new surface disturbance activities at the site, the presence of construction vehicles from off-site, the importation of gravel, soil, or other substrate, or from other construction-related activities."		**F4-19**
2.1.3.5	2-20	All trucks and construction equipment should be inspected for the presence of seeds of invasive weeds, not just those arriving from locations with known invasive vegetation problems. Vehicles are one of the primary vectors for the transit of invasive species. Given that invasive species are one of the most significant forms of habitat modification today, controlling their spread is a critical conservation concern. The Weed Management Plan should also describe how seeds collected off construction vehicles or trucks would be disposed. Cleaning should be conducted in such a way that seeds do not migrate into water supply or soil.		**F4-20**
3.23.1.1	3.23-11	The Service disagrees that the current distribution of FTHL within the study area is from Shell Canyon Road to the east. No protocol exists to determine unoccupied habitat. Further, given the low detectability of FTHL, especially in areas of gravel substrate, it is not		**F4-21**

		reasonable to assume areas of suitable habitat that are adjacent to occupied habitat are not occupied. We consider the FTHL distribution described in the Rangewide Management Plan and illustrated in Figure 2 of that Plan to be the best available description of current FTHL distribution.		**F4-21, cont.**
3.23.1.1	3.23-22	The Department disagrees with the statement that the site is unoccupied. Based on the applicant's surveys PBS have not been documented within the project site footprint. However, absence of sheep sign does not equate to the site being unoccupied. As stated in the third paragraph current collared sheep data for the area represent less than 10% of the population and data of PBS use in the area is continuing to evolve.		**F4-22**
4.2.10	4.2-21	Please ensure that impacts, such as soil compaction and disturbance, to areas other than access roads or graded areas that would be accessed by water tenders or other heavy equipment, are identified and analyzed.		**F4-23**
4.14.10	4.14-17	As a best management practice for soil, in the sentence "Disturbed soils should be reclaimed as quickly as possible or protective covers should be applied," "or" should be replaced by "and".		**F4-24**
4.17.3.1	4.17-7	The Department requests the FEIS/FEIR include the details of the mitigation measures (acreage of mitigation proposed, how/where that mitigation will be accomplished, etc.) to offset the permanent and temporary impacts to jurisdictional waters and riparian vegetation. Simply referring to obtaining a streambed agreement or submitting a future jurisdictional mitigation plan to the Department is not sufficient.		**F4-25**
4.17.10	4.17-24, Veg-1a	Flagging or staking should be used to delineate areas of vehicular use. Doing so will further minimize unnecessary impacts to vegetation and soil communities.		**F4-26**
4.17.10	4.17-24, Veg-1a	See comment above for 2.1.3.1, 2-9.		**F4-27**
4.17.10	4.17-24, Veg-1a	While drive and crush is preferable, implementing only vegetation clearing, and not grubbing or grading, is an additional, intermediate possibility to minimize construction impacts and promote vegetation recovery. This alternative method should be added to Mitigation Measure Veg-1a.		**F4-28**
4.17.10	4.17-25, Veg-1b	In addition to compliance inspections during on-going construction, the Designated Biologist should be responsible for conducting compliance inspections *during* clearing, grubbing, and grading. Doing so will ensure the containment of disturbance within delineated boundaries. This responsibility should be added to Mitigation Measure Veg-1b.		**F4-29**
4.17.10	4.17-25,	Mitigation Measure Veg-1c should be revised to ensure any container stock plants or native		**F4-30**

	Veg-1c	seed used during revegetation originates from sites as close as possible to the project site in geographic distance or ecological similarity. Doing so will help preserve the genetic integrity of area populations and facilitate maximum survivorship of plants used for revegetation.		F4-30, cont
4.17.10	4.17-25, Veg-2a	Given the time period required for restoration in the desert and its tenuous success, species of concern, such as Peninsular bighorn sheep, experience a temporal net loss of habitat for decades during the time between construction and post-decommissioning restoration. While the applicant would implement restoration activities (e.g., decompacting soils, seeding, and non-native species control) following decommissioning, current habitat would be permanently lost or ecologically unsuitable for decades to come. When and if successful restoration of these areas would render the habitat suitable for Peninsular bighorn sheep or other species of concern cannot be determined at this time. Consequently, the Agencies disagree that restoration alone is likely to be appropriate to offset permanent adverse effects to suitable habitat for these species. Mitigation Measure Veg-2a should be revised to reflect a mitigation strategy that includes acquisition of lands supporting suitable, undisturbed habitat coupled with targeted restoration efforts to adequately offset adverse impacts to listed and other wildlife and plant species.		F4-31
4.17.10	4.17-25, Veg-2b	Mitigation Measure Veg-2b should be revised to include soil decompaction as part of restoration. Doing so will also make this sentence compatible with the sentence on page 4.17-26 that lists typical restoration measures for desert environments.		F4-32
4.17.10	4.17-26, Veg-2b	Delete "generally" from the sentence beginning "Restoration measures in desert environments…" in Mitigation Measure Veg-2b to make this sentence compatible with the third sentence of the same mitigation measure.		F4-33
4.21.2	4.21-1	The 2003 FTHL Rangewide Management Strategy "provide[s] guidance for the conservation and management of sufficient habitat to maintain extant populations of FTHLs in each of five Management Areas in perpetuity." The BLM is a signatory to the Conservation Agreement for implementation of the Rangewide Management Strategy. As such, the Wildlife Agencies consider the Rangewide Management Strategy an "approved local, regional, or state habitat conservation plan" under Indicator Wild-4. Therefore, compliance with the FTHL Rangewide Management Strategy should be addressed in the analysis of project impacts.		F4-34
4.21.3.1	4.21-2	Figure 4.21-2 should be revised to illustrate a 2 mile buffer around each FTHL sighting in order to determine the extent of FTHL occupied habitat and if impacts to FTHL have been		F4-35

		adequately determined. In accordance with the FTHL Rangewide Management Strategy, all contiguous habitat within two miles of a FTHL sighting is considered occupied by FTHL.		**F4-35, cont.**
4.21.3.1	4.21-5	The applicant should note that they will need to prepare a burrowing owl mitigation and monitoring plan that specifies how they will mitigate any direct impacts to burrows on site (e.g. 2:1 artificial burrow replacement, onsite monitoring) and that the plan will be approved by the Wildlife Agencies prior to ground disturbance.		**F4-36**
4.21.3.1	4.21-6	The Wildlife Agencies disagree with the statement that "The temporary impacts to approximately 483.1 acres of vegetation would be considered a short-term impact because those areas would be revegetated following construction." Given the time period required for restoration in the desert and its tenuous success, there will be an unknown amount of temporal change of foraging habitat quality for the Golden Eagle. The project proponent did not identify the possible direct effect of an eagle being killed by a turbine during operation. There are 2 active eagle territories near the project site and site surveys detected 22 eagles within the project area. The Department is pleased that Mitigation Measure Wild-1o is being developed to minimize and mitigate potential impacts to the eagle; however the Merlin Avian Radar System is a new and experimental technology. Therefore, eagle mortality may still occur and as stated previously in section 3.23 the eagle is a state fully protected species (Fish and Game Code 3511) and no take is permitted.		**F4-37**
4.21.3.1	4.21-7	The possible positive effect of night lighting during construction on bat populations may be negated if bats are at higher densities in the area when the turbines begin operation because of having been attracted to the temporary pulse in prey density.		**F4-38**
4.21.3.1	4.21-8	Loss of essential habitat should be added as a direct effect of the proposed action on Peninsular bighorn sheep.		**F4-39**
4.21.3.1	4.21-10	The list of existing human presence under bullet (4), intermountain movement, should be revised to include use of the area by immigrants and drug traffickers.		**F4-40**
4.21.3.1	4.21-10	The Wildlife Agencies disagree with the statement that "The Proposed Action would not result in additional habitat fragmentation of suitable PBS habitat because the proposed OWEF site is not currently occupied." Fragmentation and occupancy are distinct ecological concepts. Currently unoccupied habitat does not equate to unsuitable habitat. For species such as Peninsular bighorn sheep that demonstrate metapopulation dynamics, suitable but unoccupied habitats are necessary for maintaining population and genetic connectivity. Population persistence requires a balance between local colonization and extirpation events		**F4-41**

		across the landscape. All patches of habitat have a non-zero probability of extinction, meaning that over time suitable habitat will fluctuate between occupied and unoccupied. Therefore, conservation of currently unoccupied but suitable habitat is essential for species persistence. The elimination of all unoccupied patches of suitable habitat will likely lead to regional extinction. Occupancy is thus the result of probabilistic occurrence of individuals across the landscape due to both population dynamics and availability of suitable habitat. Fragmentation, on the other hand, describes changes in the quality and distribution of a species habitat across the landscape. Fragmentation refers to discontinuity in the spatial distribution of a species' habitat, in an area or at a given scale that affects the occupancy, reproduction, or survival of the focal species. Fragmentation can occur when previously continuous areas that support resources needed by a given species become divided into discrete, separated areas, each one of which may or may not continue to be suitable for species occupancy. Fragmentation can occur at a variety of scales, from a range-wide scale (when the entire range of a species is divided into two or more subranges, or when populations are separated from one another), a population scale (when movement of individuals within a population is impeded), or within one individual's home range (when the area used by one individual is fractured). Fragmentation often, though not always, occurs simultaneously with habitat loss. Sheep sign was documented throughout the proposed project site; consequently, any habitat loss resulting from the proposed action could fragment Peninsular bighorn sheep populations, if the loss severs connectivity between suitable and occupied areas.		**F4-41, cont.**
4.21.3.1	4.21-12	O&M activities that may cause impacts to burrowing owls should be included in the burrowing owl mitigation and monitoring plan.		**F4-42**
4.21.3.1	4.21-19	Please clarify what O&M actions are referred to as possibly resulting in disturbance beyond the approved permanent footprint. To accurately assess the impact of all O&M activities, it is necessary to include a description of the existing habitat conditions, where all O&M activities would occur, how frequently they would occur, how wide the disturbance areas would be, what equipment would be used, and the timing of these activities. Any action should be within the proposed BLM ROW.		**F4-43**
4.21.3.1	4.21-19	As collision with construction equipment is listed as a possible direct impact to Peninsular bighorn sheep during O&M, please clarify under what circumstances construction equipment would be used during O&M. In addition, note that the Peninsular bighorn sheep is a state		**F4-44**

		fully protected species (Fish and Game Code 4700) and no take is permitted. Implementation of measure Wild-1gg should prevent any direct take of sheep due to collision with vehicles or equipment.		**F4-44, cont.**
4.21.3.1	4.21-19	This section states that the OWEF site would not be fenced. Please reconcile this with statements in 2.1.3.1 that at least the O&M facility, utility switchyard/substation, and meteorological towers will be permanently fenced, and other areas possibly temporarily fenced for security. Any fencing that is constructed should be designed in coordination with the Wildlife Agencies to ensure impacts to Peninsular bighorn sheep are minimized. Please see comments on 2.1.3.1 that pertain to fencing.		**F4-45**
4.21.3.1	4.21-19	It is premature to conclude that lack of fencing is the only prerequisite for maintaining foraging areas. The site may or may not continue to serve as foraging area, depending on levels of disturbance, extent of project footprint impacts, what vegetation is undisturbed, rates of recovery of disturbed vegetation, and other factors.		**F4-46**
4.21.3.1	4.21-20	Please see comments above on 4.21.3.1, page 4.21-10, on habitat fragmentation.		**F4-47**
4.21.3.1	4.21-21	The discussion of Peninsular bighorn sheep habitat fragmentation addresses only impacts associated with human activity levels. As previously stated, fragmentation could also result from habitat loss. As some habitat loss would occur, it is inappropriate to conclude that no additional habitat fragmentation for this species would occur due to the proposed action.		**F4-48**
4.21.3.2	4.21-25	The proposed action would also have a significant impact to Peninsular bighorn sheep through loss of habitat. Habitat loss could occur in several ways: in areas defined as undergoing permanent impacts; in "temporary" impact areas in which revegetation and restoration are incomplete, and therefore still unsuitable; and if areas of otherwise suitable habitat are unused due to project-related impacts on sheep behavior.		**F4-49**
4.21.10	4.21-42	Please clarify how the number of Biological Monitors will be determined.		**F4-50**
4.21.10	4.21-43, Wild-1d	Please provide additional information on soil storage procedures. Best management practices would include minimization of the amount of time soil is stored, to ensure maximum retention of seed viability and soil properties. Please elaborate on how disturbance from stockpiling would be minimized.		**F4-51**
4.21.10	4.21-43, Wild-1f	In the first sentence of Wild-1f, ground-disturbing activities other than grading should also be included.		**F4-52**
4.21.10	4.21-43, Wild-1f	The active season of FTHL should be defined as March 15 – November 15, not March 1 – September 30. Few FTHL are typically observed above ground prior to March 15. Adult FTHL are often observed later than September 30, although interannual variation exists		**F4-53**

		depending on environmental conditions. Most adults are dormant by November 15.		F4-53, cont.
4.21.10	4.21-44, Wild-1f	A Designated Biologist or Biological Monitor should be present during any grading that occurs outside of the FTHL active period, as well as during the removal of FTHL from harm's way, in order to ensure no FTHL mortality results. A sentence to this effect should be added to Wild-1f.		F4-54
4.21.10	4.21-44, Wild-1g	Under the supervision of a qualified Designated Biologist or Biological Monitor, FTHL found on access or maintenance roads should also be removed to areas outside the project boundary where suitable burrowing habitat exists. A sentence to this effect should be added to Wild-1g.		F4-55
4.21.10	4.21-44, Wild-1i	Several other methods for minimizing night lighting should be employed on site. For instance, use of night lighting should be restricted to periods when necessary for worker safety. If used for security, night lighting should be motion or heat activated. Instituting such practices would minimize electricity use and lighting impacts on surrounding natural areas and wildlife.		F4-56
4.21.10	4.21-44, Wild-1g	The applicant should consider installing exclusionary fencing for flat-tailed horned lizard (FTHL) near the most heavily trafficked roads during construction.		F4-57
4.21.10	4.21-45, Wild-1k	If any barefoot banded geckos are found on-site during construction, project activities must be halted until a 2081 permit for incidental take can be obtained from the California Department of Fish and Game.		F4-58
4.21.10	4.21-45, Wild-1q	See comments above for 4.17.10, 4.17-10.		F4-59
4.21.10	4.21-46, Wild-1r	The threats to Peninsular bighorn sheep vary throughout its range. Northern populations in the Coachella Valley, for instance, face greater threats from urban development than do their southern counterparts. Consequently, compensation for project impacts would best occur if lands within Essential Habitat acquired or restored for mitigation are located as close as possible to the project site. Proximate location would ensure that mitigation benefits the I-8 Island/Carrizo Canyon/Coyote Mountains sheep populations, which would likely be affected by the proposed action.		F4-60
4.21.10	4.21-46, Wild-1r	All lands acquired or restored as compensation for project impacts to Peninsular bighorn sheep should support suitable bighorn sheep habitat. Most lands within the USFWS Essential Habitat boundaries are likely to be suitable habitat. If lands proposed for acquisition or restoration are outside Essential Habitat, a qualified Peninsular bighorn sheep biologist should first verify that such lands constitute suitable habitat.		F4-61

4.21.10	4.21-46, Wild-1t	The Wildlife Agencies recommends that multiple methods be employed by the Bighorn Sheep Monitor to detect Peninsular bighorn sheep individuals or recent sign. Methods can include regular site walks, use of binoculars, the observation tower, and cautious use of radar data, among others.		F4-62
4.21.10	4.21-46, Wild-1t	Please clarify what type of construction activities would be unlikely to adversely affect or disrupt normal Peninsular bighorn sheep behavior and therefore could occur within 1,000 feet of an individual. Also include what criteria the Bighorn Sheep Monitor would use to evaluate likelihood of behavioral disruption to sheep because of the construction activity.		F4-63
4.21.10	4.21-47, Wild-2b	In the first sentence of Wild-2b, construction activities other than clearing should also be included.		F4-64
4.21.10	4.21-47, Wild-1u	Whenever feasible, all ground-disturbing activities should occur *during* the FTHL active period, when the probability of detection is higher. The third bullet point of Wild-1u should thus be modified in two ways. First, "outside" should be replaced with "during". Second, the FTHL active period should be explicitly defined as March 15 – November 15. These changes would also reconcile Wild-1u (activities during O&M) and Wild-1f (activities during construction). See also the comment for Wild-1f.		F4-65
4.21.10	4.21-47, Wild-1u	See comment above for 4.21.3.1, 4.21-19.		F4-66
4.21.10	4.21-49, Wild-1gg	See comment above for 4.21.10, 4.21-46.		F4-67
4.21.10	4.21-49, Wild-1gg	If Peninsular bighorn sheep were detected during the night on the vision video system, the Bighorn Sheep Monitor should be responsible for verifying sheep are no longer present on site in the morning before any O&M actions proceed. Please add a sentence to Wild-1gg reflecting this responsibility.		F4-68

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY EDMUNG G. BROWN Jr., Governor

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11-IMP-8
PM 10.01
Ocotillo Express Wind Energy
DEIR - SCH #2010121055

Angelina Havens
Imperial County
Planning & Development Services
801 Main St.
El Centro, CA 92243

Dear Ms. Havens:

The California Department of Transportation (Caltrans) received a copy of the Draft Environmental Impact Report (DEIR) for the proposed Ocotillo Express Wind Energy project (SCH #2010121055) located on Interstate 8 (I-8). Caltrans has the following comments:

The DEIR identifies that the project is proposing to connect to the SDG&E Sunrise Powerlink transmission line. Any utility crossings of highways or freeways will need an encroachment permit from Caltrans. Please refer to Caltrans Encroachment Permits Manual (http://www.dot.ca.gov/hq/traffops/developserv/permits/encroachment_permits_manual/index.html) for guidance on utility encroachment. The following information is contained in Chapter 600, Table 6.7 (page 6-35) of the Encroachment Permit Manual. Line supports for overhead lines crossing freeways must comply with these requirements, they:

1. Should have a minimum lateral clearance of 30' from the edge of a through lane and 30' from the edge of a ramp lane, when possible.
2. Shall be located outside the right-of-way (R/W) or between the R/W line and access control line if different. Any other placement must be approved by the Division of Design, Chief.
3. Should not be permitted in medians.
4. Should not be permitted on cut or fill slopes.
5. Shall not impair sight distances.
6. Shall be compatible with access requirements.

S1-01

Please refer to Caltrans Encroachment Permits Manual (Appendix E, Transportation Plan Management Guidelines) for guidance on Traffic Control on freeways for the placement of aerial lines. The construction of safety nets is another option that is outlined further in the Caltrans Encroachment Manual (Appendix E, H Support Diagram for Aerial Crossings). **S1-02**

Any work performed within Caltrans R/W must provide an approved final environmental document including the California Environmental Quality Act (CEQA) determination addressing any environmental impacts within the Caltrans' R/W, and any corresponding technical studies. If these materials are not included with the encroachment permit application, the applicant will be required to acquire and provide these to Caltrans before the permit application will be accepted. Identification of avoidance and/or mitigation measures will be a condition of the encroachment permit approval as well as procurement of any necessary regulatory and resource agency permits **S1-03**

Additional information regarding encroachment permits may be obtained by contacting the Caltrans Permits Office at (619) 688-6158. Early coordination with Caltrans is strongly advised for all encroachment permits. **S1-04**

If you have any questions on the comments Caltrans has provided, please contact Marisa Hampton of the Development Review Branch at (619) 688-6954.

Sincerely,

JACOB M. ARMSTRONG, Chief
Development Review Branch

c: Armando G. Villa, Imperial County

Comment Letter S2

From: Jay Mirpour
To: EwingDuo@aol.com
Cc: caocotillo@blm.gov; Angelina Havens; delms@dfg.ca.gov; Lanika.L.Cervantes@usace; John Carmona
Subject: Re: Ocotillo Wind Energy Project
Date: Monday, September 12, 2011 11:18:07 AM

Hello Mr. Ewing:

Thank you for contacting us regarding the subject project. My questions are:

1) Have you contacted the Lead agency for this project (Imperial County Planning and Development Services)?

2) Have you expressed your concerns to the U.S. Army Corps of Engineers and the Department of Fish and Games?

3) Have you submitted your concerns to BLM and attended the public meetings?

If it is decided that our office issue a 401 Certification for the project, we will make sure that conditions will be added to address those issues that you are concern about. S2-01

I will also forward your e-mail to the following individuals for further assistance:

Imperial County Planning and Development Services - Ms. Angelina Havens
U.S. Army Corps of Engineers, Depart - Ms. Lanika Cervantes
California Department of Fish and Game - Mr. David Elms
Regional Water Board - Mr. John Carmona who is also supervisor for the Stormwater program
BLM Project Manager - Mr. Cedric Perry

Thank you

Jay Mirpour

Jay J. Mirpour
Water Resources Control Engineer
California Regional Water Quality Control Board
Colorado River Basin Region - 7
73-720 Fred Waring Drive, Suite 100
Palm Desert, CA 92260
Ph: (760) 776-8981
Fax: (760) 341-6820
E-mail: jmirpour@waterboards.ca.gov

>>> <EwingDuo@aol.com> 9/10/2011 7:02 PM >>>
Mr. Mirpour:

My name is Parke Ewing, I am a resident of Ocotillo, Ca. 92259, I live at 98 Imperial Hwy, my mailing address is PO Box 84. I have resided in this area for approximately 20 years. The proposed site for the Ocotillo Wind Energy Project is located on land managed by The Bureau of Land Management (BLM). The area is currently designated a "Limited Use" area. Pattern Energy is proposing somewhere between 105 to 244 wind turbine generators to be constructed on about 13,000 acres very close to the town of Ocotillo, not 5 miles outside of town as Pattern Energy and BLM states.

The project will also require, per Pattern Energy estimate, the construction of 42 miles of new roads to gain access to their wind turbine sites and for their electrical distribution system. The area in the proposed site has several washes that carry rain water from higher elevations to the desert floor in somewhat of an organized natural method. I am very concerned that the impact of the additional roads will divert rain water to my property or others when the rains are heavy. And, I am very concerned that this potential problem has not been adequately addressed in the draft EIR/EIS report. The potential destruction to the ecosystem, wildlife and homes is a very real concern and is being whitewashed through the fast tracked approval process.

Other environmental concerns are contamination by water runoff, from soil stabilization chemicals that Pattern stated would be used for dust control during construction of this project. It has been proven that these chemicals are hazardous to humans, wildlife and plants.

I have seen washes in this area completely full and overflowing to all parts of this town, flooding homes and destroying roadways within its path. Everyone has forgotten the impact that heavy rains can do to this area. How will the new roads impact this area?

Please visit this site and talk with the people before approving anything to do with this project. We can show you why this project is not suitable for this area.

Thank you:
Parke Ewing

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov
The subject line should be: Ocotillo Wind Energy Project

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter S3

STATE OF CALIFORNIA Edmund G. Brown, Jr., *Governor*

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-6251
Fax (916) 657-5390
Web Site www.nahc.ca.gov
ds_nahc@pacbell.net

August 17, 2011

Ms. Angelina Havens, Planner
County of Imperial Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Mr. Jim Kenna, California State Office Director
United States Department of the Interior
Bureau of Land Management
2800 Cottage Way
Sacramento, CA 95825

RECEIVED
AUG 22 2011
IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

Re: SCH#2010121055 Joint CEQA/NEPA Notice; draft Environmental Impact Report (DEIR) and draft Environmental Impact Statement (DEIS) for the **"Ocotillo Wind Energy Facility Project;"** for construction in two Phases of Wind Turbine Generators to produce up to 465 megawatts (MW) of electrical energy, the electricity generated would interconnect to an electrical transmission grid with the Sunrise Powerlink of San Diego Gas & Electric Co, a unit of Sempra Energy. The project is located on approximately 12,436-acres of mostly on Bureau of Land Management property but also on some private land; Imperial County, California.

Dear Ms. Havens and Mr. Kenna:

The Native American Heritage Commission (NAHC), the State of California 'Trustee Agency' for the protection and preservation of Native American cultural resources pursuant to California Public Resources Code §21070 and affirmed by the Third Appellate Court in the case of EPIC v. Johnson (1985: 170 Cal App. 3rd 604). The NAHC at the request of local culturally-affiliated tribes opposes approval of the proposed Project in its present form, as presented in the Environmental Impact Report (EIR), prepared under the California Environmental Quality Act (CEQA) and also the draft Environmental Impact Statement (EIS), prepared under the provisions of the National Environmental Policy Act (NEPA). **S3-01**

This letter includes state and federal statutes relating to Native American historic properties of religious and cultural significance to American Indian tribes and interested Native American individuals as 'consulting parties' under both state and federal law. State law also addresses the freedom of Native American Religious Expression in Public Resources Code §5097.9.

The California Environmental Quality Act (CEQA – CA Public Resources Code 21000-21177, amendments effective 3/18/2010) requires that any project that causes a substantial adverse change in the significance of an historical resource, that includes archaeological resources, is a 'significant effect' requiring the preparation of an Environmental Impact Report (EIR) per the CEQA Guidelines defines a significant impact on the environment as 'a substantial, or potentially substantial, adverse change in any of physical conditions within an area affected by the proposed project, including …objects of historic or aesthetic significance." In order to comply with this provision, the lead agency is required to assess whether the project will have an adverse impact on these resources within the 'area of potential effect (APE), and if so, to mitigate that effect. The NAHC Sacred Lands File (SLF) search resulted as follows: **Native American cultural resources were and are identified** within the 'area of potential effect (APE).. Not only are there Native American archaeological/cultural features at the sites, but the NAHC has been notified that there are reports of human remains, apparently of ancient origin, at six locations within the project area. S3-02

The NAHC "Sacred Sites,' as defined by the Native American Heritage Commission and the California Legislature in California Public Resources Code §§5097.94(a) and 5097.96. Items in the NAHC Sacred Lands Inventory are confidential and exempt from the Public Records Act pursuant to California Government Code §6254 (r).

Early consultation with Native American tribes in your area is the best way to avoid unanticipated discoveries of cultural resources or burial sites once a project is underway. Culturally affiliated tribes and individuals may have knowledge of the religious and cultural significance of the historic properties in the project area (e.g. APE). We strongly urge that you make contact with the list of Native American Contacts on the attached list of Native American contacts, to see if your proposed project might impact Native American cultural resources and to obtain their recommendations concerning the proposed project. Pursuant to CA Public Resources Code § 5097.95, the NAHC requests that the Native American consulting parties be provided pertinent project information. Consultation with Native American communities is also a matter of environmental justice as defined by California Government Code §65040.12(e). Pursuant to CA Public Resources Code §5097.95, the NAHC requests that pertinent project information be provided consulting tribal parties. The NAHC recommends *avoidance* as defined by CEQA Guidelines §15370(a) to pursuing a project that would damage or destroy Native American cultural resources and Section 2183.2 that requires documentation, data recovery of cultural resources. S3-03

Furthermore, the NAHC is of the opinion that the current project remains under the jurisdiction of the statutes and regulations of the National Environmental Policy Act (e.g. NEPA; 42 U.S.C. 4321-43351). Consultation with tribes and interested Native American consulting parties, on the NAHC list, should be conducted in compliance with the requirements of federal NEPA and Section 106 and 4(f) of federal NHPA (16 U.S.C. 470 *et seq*), 36 CFR Part 800.3 (f) (2) & .5, the President's Council on Environmental Quality (CSQ, 42 U.S.C 4371 *et seq.* and NAGPRA (25 U.S.C. 3001-3013) as appropriate. The 1992 *Secretary of the Interiors Standards for the Treatment of Historic Properties* were revised so that they could be applied to all historic resource types included in the National Register of Historic Places and including cultural landscapes. Also, federal Executive Orders Nos. 11593 (preservation of cultural environment), 13175 (coordination & consultation) and 13007 (Sacred Sites) are helpful, supportive guides for Section 106 consultation. The aforementioned Secretary of the Interior's *Standards* include recommendations for all 'lead agencies' to consider the historic context of proposed projects and to "research" the cultural landscape that might include the 'area of potential effect.' This region in which the project is situated includes numerous Kamia archaeological features and burial grounds and known archaeological sites and sacred places identified by local Kumeyaay, Quechan and other Yuman tribal elders to the NAHC. S3-04

The response to this continued and proposed activity suggests to the NAHC that both CEQA and NEPA does apply, given the role of the U.S. Department of the Interior and the California Public Utility Commission. Confidentiality of "historic properties of religious and cultural significance" should also be considered as protected by California Government Code §6254(r) and may also be protected under Section 304 of he NHPA or at the Secretary of the Interior discretion if not eligible for listing on the National Register of Historic Places. The S3-05

Secretary may also be advised by the federal Indian Religious Freedom Act (cf. 42 U.S.C., 1996) in issuing a decision on whether or not to disclose items of religious and/or cultural significance identified in or near the APEs and possibility threatened by proposed project activity. **S3-05, cont.**

Furthermore, Public Resources Code Section 5097.98, California Government Code §27491 and Health & Safety Code Section 7050.5 provide for provisions for accidentally discovered archeological resources during construction and mandate the processes to be followed in the event of an accidental discovery of any human remains in a project location other than a 'dedicated cemetery'. **S3-06**

To be effective, consultation on specific projects must be the result of an ongoing relationship between Native American tribes and lead agencies, project proponents and their contractors, in the opinion of the NAHC. Regarding tribal consultation, a relationship built around regular meetings and informal involvement with local tribes will lead to more qualitative consultation tribal input on specific projects. **S3-07**

If you have any questions about this response to your request, please do not hesitate to contact me at (916) 653-6251.

Sincerely,

Dave Singleton
Program Analyst

Cc: State Clearinghouse

California Public Utilities Commission
Attn: Ms. Billie C. Blanchard, Environmental Review
505 Van Ness Avenue
San Francisco, CA 94102

Attachment: Native American Contact List

California Native American Contact List
Imperial County
August 17, 2011

Barona Group of the Capitan Grande
Edwin Romero, Chairperson
1095 Barona Road Diegueno
Lakeside , CA 92040
sue@barona-nsn.gov
(619) 443-6612
619-443-0681

Ewiiaapaayp Tribal Office
Robert Pinto, Chairperson
4054 Willows Road Dieguено/Kumeyaay
Alpine , CA 91901
wmicklin@leaningrock.net
(619) 445-6315 - voice
(619) 445-9126 - fax

La Posta Band of Mission Indians
Gwendolyn Parada, Chairperson
PO Box 1120 Diegueno/Kumeyaay
Boulevard , CA 91905
gparada@lapostacasino.
(619) 478-2113
619-478-2125

Manzanita Band of Kumeyaay Nation
Leroy J. Elliott, Chairperson
PO Box 1302 Kumeyaay
Boulevard , CA 91905
ljbirdsinger@aol.com
(619) 766-4930
(619) 766-4957 Fax

San Pasqual Band of Mission Indians
Allen E. Lawson, Chairperson
PO Box 365 Diegueno
Valley Center, CA 92082
allenl@sanpasqualband.com
(760) 749-3200
(760) 749-3876 Fax

Iipay Nation of Santa Ysabel
Virgil Perez, Spokesman
PO Box 130 Diegueno
Santa Ysabel, CA 92070
brandietaylor@yahoo.com
(760) 765-0845
(760) 765-0320 Fax

Sycuan Band of the Kumeyaay Nation
Danny Tucker, Chairperson
5459 Sycuan Road Diegueno/Kumeyaay
El Cajon , CA 92021
ssilva@sycuan-nsn.gov
619 445-2613
619 445-1927 Fax

Viejas Band of Kumeyaay Indians
Anthony R. Pico, Chairperson
PO Box 908 Diegueno/Kumeyaay
Alpine , CA 91903
jrothauff@viejas-nsn.gov
(619) 445-3810
(619) 445-5337 Fax

This list is current only as of the date of this document.
Distribution of this list does not relieve any person of the statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed SCH#2010121055; Joint CEQA/NEPA Document and Notice; draft EIR and draft "EIS for the Ocotillo Wind Energy Facility Project; " for construction in two phases, Wind Turbine Generators to produce up to 465 megawatts (MW) of electrical energy; the electricity generated would interconnect to an electrical transmission grid with the Sunrise Powerlink of San Diego Gas & Electric Co., a unit of Sempra Energy. The project is located on approx. 12,436-aacres of mostly federal and but with some private land. Location is the Yuha Desert of Imperial County, California.

California Native American Contact List
Imperial County
August 17, 2011

Kumeyaay Cultural Historic Committee
Ron Christman
56 Viejas Grade Road Diegueno/Kumeyaay
Alpine , CA 92001
(619) 445-0385

Kumeyaay Cultural Heritage Preservation
Paul Cuero
36190 Church Road, Suite 5 Diegueno/ Kumeyaay
Campo , CA 91906
(619) 478-9046
(619) 478-9505
(619) 478-5818 Fax

Campo Kumeyaay Nation
Monique LaChappa, Chairperson
36190 Church Road, Suite 1 Diegueno/Kumeyaay
Campo , CA 91906
(619) 478-9046
miachappa@campo-nsn.gov
(619) 478-5818 Fax

Kwaaymii Laguna Band of Mission Indians
Carmen Lucas
P.O. Box 775 Diegueno -
Pine Valley , CA 91962
(619) 709-4207

Jamul Indian Village
Kenneth Meza, Chairperson
P.O. Box 612 Diegueno/Kumeyaay
Jamul , CA 91935
jamulrez@sctdv.net
(619) 669-4785
(619) 669-48178 - Fax

San Pasqual Band of Indians
Kristie Orosco, Environmental Coordinator
P.O. Box 365 Luiseno
Valley Center, CA 92082 Diegueno
(760) 749-3200
council@sanpasqualtribe.org
(760) 749-3876 Fax

Mesa Grande Band of Mission Indians
Mark Romero, Chairperson
P.O Box 270 Diegueno
Santa Ysabel, CA 92070
mesagrandeband@msn.com
(760) 782-3818
(760) 782-9092 Fax

Ewiiaapaayp Tribal Office
Will Micklin, Executive Director
4054 Willows Road Diegueno/Kumeyaay
Alpine , CA 91901
wmicklin@leaningrock.net
(619) 445-6315 - voice
(619) 445-9126 - fax

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California Native American Contact List
Imperial County
August 17, 2011

Campo Kumeyaay Nation
Monique LaChappa, Chairperson
36190 Church Road, Suite 1 Dieguenο/Kumeyaay
Campo , CA 91906
(619) 478-9046
miachappa@campo-nsn.gov
(619) 478-5818 Fax

Kumeyaay Cultural Heritage Preservation
Paul Cuero
36190 Church Road, Suite 5 Dieguenο/ Kumeyaay
Campo , CA 91906
(619) 478-9046
(619) 478-9505
(619) 478-5818 Fax

Fort Yuma Quechan Indian Nation
Keeny Escalanti., President
PO Box 1899 Quechan
Yuma , AZ 85366
qitpres@quechantribe.com
(760) 572-0213
(760) 572-2102 FAX

Torres-Martinez Desert Cahuilla Indians
Diana L. Chihuahua, Vice Chairperson, Cultural
P.O. Boxt 1160 Cahuilla
Thermal , CA 92274
dianac@torresmartinez.
760) 397-0300, Ext. 1209
(760) 272-9039 - cell (Lisa)
(760) 397-8146 Fax

Cocopah Museum/Cultural Resources Dept.
Jill McCormick, Tribal Archaeologist
County 15th & Ave. G Cocopah
Sommerton , AZ 85350
culturalres@cocopah.com
(928) 530-2291 - cell
(928) 627-2280 - fax

Quenchan Indian Nation
THPO
P.O. Box 1899 Quechan
Yuma , AZ 85366
b.nash@quechantribe.com
(928) 920-6068 - CELL
(760) 572-2423

Ah-Mut-Pipa Foundation
Preston J. Arrow-weed
P.O. Box 160 Quechan
Bard , CA 92222 Kumeyaay
ahmut@earthlink.net
(928) 388-9456

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California Native American Contact List
Imperial County
August 17, 2011

Manzanita Band of Mission Indians
ATTN: Keith Adkins, EPA Director
PO Box 1302 Kumeyaay
Boulevard , CA 91905
(619) 766-4930
(619) 766-4957 Fax

Viejas Kumeyaay Indian Reservation
Frank Brown, Chair-Inter-Tribal Cultural Comte
240 Brown Road Dieguenо/Kumeyaay
Alpine , CA 91901
FIREFIGHTER69TFF@AOL.
619) 884-6437

Ipai Nation of Santa Ysabel
Clint Linton, Director of Cultural Resources
P.O. Box 507 Diegueno/Kumeyaay
Santa Ysabel, CA 92070
cjlinton73@aol.com
(760) 803-5694
cjlinton73@aol.com

Kumeyaay Cultural Repatriation Committee
Bernice Paipa, Vice Spokesperson
P.O. Box 1120 Diegueno/Kumeyaay
Boulevard , CA 91905
(619) 478-2113

Sycuan Band of the Kumeyaay Nation
Sydney Morris, Environmental Coordinator
5459 Sycuan Road Diegueno/Kumeyaay
El Cajon , CA 92021
smorris@sycuan-nsn.gov
(619) 445-2613
(619) 445-1927-Fax

Manzanita Band of the Kumeyaay Nation
Leroy J. Elliott, Chairperson
P.O. Box 1302 Diegueno/Kumeyaay
Boulevard , CA 91905
(619) 766-4930
(619) 766-4957 - FAX

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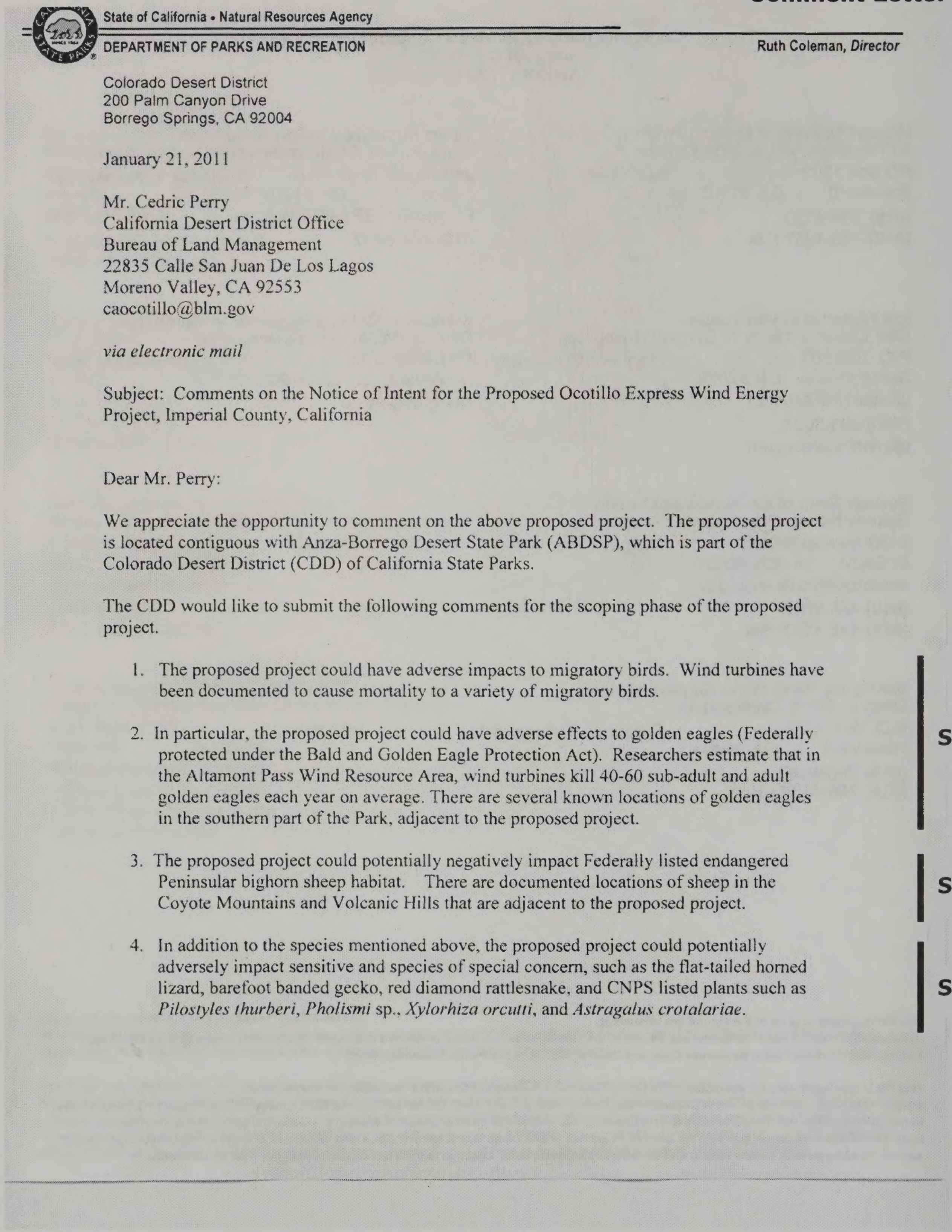
Comment Letter S4



State of California • Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION
Ruth Coleman, *Director*

Colorado Desert District
200 Palm Canyon Drive
Borrego Springs, CA 92004

January 21, 2011

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
caocotillo@blm.gov

via electronic mail

Subject: Comments on the Notice of Intent for the Proposed Ocotillo Express Wind Energy Project, Imperial County, California

Dear Mr. Perry:

We appreciate the opportunity to comment on the above proposed project. The proposed project is located contiguous with Anza-Borrego Desert State Park (ABDSP), which is part of the Colorado Desert District (CDD) of California State Parks.

The CDD would like to submit the following comments for the scoping phase of the proposed project.

1. The proposed project could have adverse impacts to migratory birds. Wind turbines have been documented to cause mortality to a variety of migratory birds.
2. In particular, the proposed project could have adverse effects to golden eagles (Federally protected under the Bald and Golden Eagle Protection Act). Researchers estimate that in the Altamont Pass Wind Resource Area, wind turbines kill 40-60 sub-adult and adult golden eagles each year on average. There are several known locations of golden eagles in the southern part of the Park, adjacent to the proposed project.

S4-01

3. The proposed project could potentially negatively impact Federally listed endangered Peninsular bighorn sheep habitat. There are documented locations of sheep in the Coyote Mountains and Volcanic Hills that are adjacent to the proposed project.

S4-02

4. In addition to the species mentioned above, the proposed project could potentially adversely impact sensitive and species of special concern, such as the flat-tailed horned lizard, barefoot banded gecko, red diamond rattlesnake, and CNPS listed plants such as *Pilostyles thurberi*, *Pholismi* sp., *Xylorhiza orcutti*, and *Astragalus crotalariae*.

S4-03

5. The proposed project could also have negative impacts on the viewsheds from the Park. Such impacts could also have potential impacts to Park visitation and tourism economies associated with the Park. **S4-04**

6. The District requests a thorough analysis of potential transmission and cumulative impacts that might affect the Park. **S4-05**

7. Potential paleontological resources. The Colorado Desert Stout Research Center (DSRC) is a professional, permanent repository for paleontologic resources collected from private, State and Federal lands. The DSRC is part of the Department of Parks and Recreation (DPR) state-wide museum system and is compliant with the DPR *Museum Collections Management Handbook* (2000) directives. Additionally, the DSRC upholds professional museum standards and is in accord with the Federal Department of the Interior's *Museum Management Handbook* D 411 (2009). Paleo Solutions, a contractor for the proposed project, has been in communication with the DSRC and DSRC has provided a letter (Jan. 20, 2011) affirming that our institution will accept and professionally curate paleontologic collections and accompanying samples, records, electronic data, maps, photographs, field notes, and other documents derived from professional standard paleontologic work conducted by Paleo Solutions Inc. for paleontologic materials recovered during the Ocotillo Express Wind project. The DSRC further agrees to assume permanent curatorial responsibility for such materials owned by and on behalf of the Bureau of Land Management (*Interagency Cooperative Agreement* 1994). **S4-06**

   Pursuant to a request by Paleo Solutions (28 June 2010) a search of the archival records, collections database and GIS data at the DSRC for paleontological resources on lands within one mile of the proposed Ocotillo Wells Express wind farm project (Ocotillo Express 2009) was conducted 02 July 2010. No paleontological sites adjacent to or within this area were found on record. **S4-07**

   DSRC further communicated to Paleo Solutions that as far as DSRC is aware no paleontological surveys had been previously performed and/or reported for the proposed project area. However, geological formations known to be paleontologically sensitive that yield significant remains in Anza-Borrego Desert State Park (ABDSP) crop out within the project area (Division of Mines and Geology 1962, Ocotillo Express 2009). **S4-08**

   Most of the proposed project footprint seems to be underlain by Quaternary alluvium. Such sediments, usually with no known paleontologic signature at the surface, may yield significant fossils at shallow depths. For example, Quaternary alluvium in Diamond Valley, Riverside County, of similar lithology and depositional setting to that in the project area, was found contain very abundant and highly significant Pleistocene vertebrate remains (Springer et al. 2009). Given these findings, the sensitivity of Quaternary alluvium locally may be high, and it can not be assumed that such deposits do not contain significant fossil remains. **S4-09**

   Although, most of the site is underlain by Quaternary alluvial deposits, geological mapping includes outcrops of Oligo-Miocene volcanics of the Alverson Formation (*Tv* on the Ocotillo Express geologic map) and sandstones and conglomerates probably of the Split Mountain Group or Red Rock Formation (*Mc* on the Ocotillo Express geologic map) within the project area. Such deposits are generally considered unfossiliferous. However, sediments interbedded with the Alverson volcanics within the Volcanic Hills **S4-10**

(ABDSP) <15 km northwest of the project area, and mapped geologically as *Tv* (Division of Mines and Geology 1962), yield significant vertebrate remains and fossil woods (DSRC archives). S4-10 cont

Given the potential of encountering significant fossils, it is recommended that a paleontological survey be preformed, that a qualified paleontological monitor be present during all excavations or grading into *Tv* and Quaternary alluvial deposits, and that the Society of Vertebrate Paleontology (1995) mitigation standards be followed. S4-11

8. Potential impacts to air quality (such as wind-born particulate matter associated with soil disturbance) may impact the Park. S4-12

9. The proposed project analysis should consider the potential for existence of historic or prehistoric cultural resources and ensure compliance with Section 106 of the National Historic Preservation Act. S4-13

Colorado Desert District staff and records are available as a source of information to BLM as it conducts its review of the proposed project. For such assistance, or if you have any questions, please do not hesitate to contact me at 760-767-4037. Thank you for your consideration. S4-14

Sincerely,

Gail Sevrens
District Superintendent, Acting

Comment Letter S5

From: Sevrens, Gail [gsevr@parks.ca.gov]
Sent: Friday, September 30, 2011 5:37 PM
To: 'cperry@blm.gov'; Angelina Havens
Cc: 'Margaret_Goodro@blm.gov'
Subject: Ocotillo Wind - request for extension of comment period

Mr. Perry and Ms. Havens-
We would like to request an extension of the comment period for the Ocotillo Wind project. We require additional time to evaluate potential cumulative and other impacts.
Additionally, it has come to our attention that as a large number of Borrego Springs residents leave the area during the summer due to the climate (up to 70% of the residents are not here during the summer months), they have not had the opportunity to review the proposed project, which could have significant negative impacts to the tourism-based economy of Borrego Springs. **S5-01**

Thank you,

Gail Sevrens
District Superintendent, Acting
District Services Manager
Colorado Desert District
(760) 767-4037

CONFIDENTIALITY NOTICE: This communication with its contents may contain confidential and/or legally privileged information. It is solely for the use of the intended recipient(s). Unauthorized interception, review, use or disclosure is prohibited and may violate applicable laws including the Electronic Communications Privacy Act. If you are not the intended recipient, please contact the sender and destroy all copies of the communication.

Public Works works for the Public

ICDPW

COUNTY OF IMPERIAL

DEPARTMENT OF PUBLIC WORKS

155 S. 11th Street
El Centro, CA
92243

Tel: (760) 482-4462
Fax: (760) 352-1272

September 14, 2011

RECEIVED

SEP 14 2011

IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

Mr. Armando Villa, Director
Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Attention: Angelina Havens, Planner II

SUBJECT: Draft Plan Amendment and Draft – Environmental Impact Statement/Environmental Impact Report, located almost entirely on BLM administered lands in the Imperial Valley, approximately five miles west of the unincorporated community of Ocotillo; APN: 033-240-016-000 (etal).

Dear Mr. Villa:

This letter is in response to the Draft Plan Amendment and Draft Environmental Impact Statement/Environmental Impact Report received on July 8, 2011 for the aforementioned project. The proposed project is to construct, operate, maintain, and decommission the Ocotillo Express Wind Project, a 550-megawatt wind generation facility including a substation, administration, operation and maintenance facility on approximately 15,000 acres in Imperial County. The Draft EIS/EIR analyzes six alternatives.

Department staff has reviewed the package information and has the following comments need to be addressed:

1. Under Table 1-1 Entitlements Required for the Proposed OWEF, Page 1-14 **L1-01**

   A transportation Permit & a Grading Permit shall be included in the table listing required Permits and Approvals for Imperial County.

2. Under Construction Commitments, Page 2-18

   Transportation Plan & Traffic Management Plan prepared needs to be submitted to be reviewed and approved by the Imperial County Department of Public Works. **L1-02**

3. Under Section 3.17.1 Environmental Setting, Page 3-.17-1

   Imperial Highway is classified as Collector Road under Imperial County circulation Element. Correct document as required. **L1-03**

Shell Canyon Road, and Dos Cabezas Road classified as Local roads should be included under list of regional and local roadway facilities. Correct documents as required.

Evan Hewes Highway is classified as Prime Arterial under Imperial County Circulation Element. Correct document as required.

State Route 98 is not a County Highway, is a State highway, Correct document as required.

L1-03, cont.

The following comments are provided for the applicant as they will be included as Conditions of approval along with the other mitigation measures as identified in the EIS/EIR:

4. Imperial Highway, Shell Canyon Road, and Dos Cabezas Road are classified as a Local Roads requiring sixty (60) feet of right of way, being thirty (30) feet from existing centerline. It is required that sufficient-right-of-way be provided to meet this road classification. **(As directed by Imperial County Board of Supervisors per Minute Order #6 dated 11/22/1994 per the Imperial County Circulation Element Plan of the General Plan).**

L1-04

5. Evan Hewes Highway is classified as Prime Arterial Road, six (6) lanes, requiring one hundred and thirty six (136) feet of right of way, being sixty-eight (68) feet from existing centerline. It is requested that sufficient right-of-way be provided to meet this road classification. **(As directed by Imperial County Board of Supervisors per Minute Order #6 dated 11/22/1994 per the Imperial County Circulation Element Plan of the General Plan).**

L1-05

6. Road improvements shall be provided along the project that are in accordance with this Department and the Air Quality Control District concerning PM-10 mitigation. County roads may require gravel, paving or some other form of dust suppression if the construction traffic loading causes PM10 levels above normal allowed limits. Early consultation with the Department is highly recommended. All plans shall be reviewed and approved by the Imperial County Department of Public Works. Furthermore in the event this project triggers continual monitoring or maintenance of County roadways within their project area after the construction period, the applicant shall bond for dust suppression for the life of the project.

L1-06

7. The applicant shall furnish a Drainage and Grading Plan/Study to provide for property grading and drainage control, which shall also include prevention of sedimentation of damage to off-site properties. The Study/Plan shall be submitted to the Department of Public Works for review and approval. The applicant shall implement the approved plan. Employment of the appropriate Best Management Practices (BMP's) shall be included. **(Per Imperial County Code of Ordinances, Chapter 12.10.020 B).**

L1-07

8. An encroachment permit shall be secured from the Department of Public Works for any and all new, altered or unauthorized existing driveway(s) to access the properties through surrounding roads. As a minimum, a commercial type of driveway shall be constructed at project's main entrances. **(Per Imperial County Code of Ordinances, Chapter 12.10.020 B).** **L1-08**

9. A Transportation Permit shall be required from road agency(s) having jurisdiction over the haul route(s) for any hauls of heavy equipment and large vehicles which impose greater then legal loads on riding surfaces, including bridges. **(Per Imperial County Code of Ordinances, Chapter 12.10.020).** **L1-09**

INFORMATIVE:

The following items are for informational purposes only. The applicant is responsible to determine if the enclosed items affect the subject project.

10. The project will require a National Pollutant Discharge Elimination System (NPDES) permit and Notice of Intent (NOI) from the Regional Water Quality Control Board (RWQCB) prior to County approval of onsite grading plan. **(40 CFR 122.28).** **L1-10**

11. All on-site traffic area shall be hard surfaced to provide all weather access for fire protection vehicles. Fire/OES Standards as well as those of the Air Pollution Control District (APCD). **(Per Imperial County Code of Ordinances, Chapter 12.10.020A).** **L1-11**

12. All solid and hazardous waste shall be disposed of in an approved solid waste disposal site in accordance with existing County, State and Federal regulations. **(Per Imperial County Code of Ordinances, Chapter 8.72).** **L1-12**

Should you have any questions, please do not hesitate to contact this office. Thank you for the opportunity to review and comment on this project.

Respectfully,

William S. Brunet, PE
Director of Public Works

By:

Manuel Ortiz
Assistant County Engineer

LL/ga

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Comment Letter L2

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Prevention
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August 2, 2011

To: Imperial County Planning and Development

SUBJECT: Draft EIR for Ocotillo Wind Energy Facility

The Imperial County Fire Department thanks you for the opportunity to comment on the listed project. After review of the project delivered to this office, we will reserve the right to comment until additional information is received. Under section 3.12.1.4 Emergency Response, it states that a comprehensive Fire Management Plan will prepared and included with the Construction, Operation and Maintenance Plan. I believe that this project could propose some significant impacts to this agency and there will be concerns that need to be addressed. However, I would like to address a few current items listed under this section; **L2-01**

1.) There are only 5 Imperial County Fire Stations (1 Contract w/ City of Imperial) totally six, not 9 as listed 3.12-4.
2.) There are only 2 hospitals located in Imperial County (El Centro Regional Medical center and Pioneers Memorial Hospital) not 3 as listed on page 3.12-4. **L2-02**

The Imperial County Fire Department and staff look forward to reviewing this project upon completion. Again, thank you for the opportunity to review and comment.

Should you have any questions and or concerns, feel free to contact me at (760) 482-2422.

Respectfully submitted

Tony Rouhotas Jr.
Fire Chief/OES Coordinator

Comment Letter L3

IID
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GS-EREP August 22, 2011

Ms. Angelina Havens
Planner III
Planning & Development Services Dept.
County of Imperial
801 Main Street
El Centro, CA 92243

SUBJECT: Ocotillo Express Wind Energy Project Draft EIS/EIR

Dear Ms. Havens:

On July 13, 2011 we received from the Bureau of Land Management (BLM) and the County of Imperial the notice of availability for the Draft Environmental Impact Statement (EIS) / Environmental Impact Report (EIR) for the Ocotillo Wind Energy Facility (OWEF) project. Ocotillo Express, LLC proposes to construct, operate and maintain on approximately 12,436 acres of land near the unincorporated community of Ocotillo in Imperial County, California, a (up to) 465 MW wind energy project that includes 158 wind turbines, a substation, administration, operations and maintenance facilities, transmission, and temporary construction lay down areas. Six alternatives were developed and evaluated in the draft EIS/EIR. The project would be located on BLM-administered land except for approximately 26 acres of private land near the center of the proposed OWEF site. Additionally, 487 acres of private and public land outside the project boundaries would be utilized for road access and collection line ROWs. The proposed OWEF would connect to the new SDG&E Sunrise Powerlink (SPL) 500-kV transmission line via a 500-kV transformer and substation proposed to be located at the central part of the proposed OWEF site adjacent to the SPL transmission line.

Pursuant to the above, the Imperial Irrigation District (IID) submits the following comments on the Draft EIS/EIR:

1. Distribution circuit capacity is very limited in the project area. The project could require the relocation and upgrade of distribution infrastructure. All costs associated with the relocation and upgrade of IID electrical infrastructure to service the project will be the responsibility of the project proponent. Project proponent is urged to contact IID Energy - Customer Operations & Planning Section at 760-482-3402 for additional information regarding electrical service for the project. **L3-01**

2. Only lands that are within the All-American Canal (AAC) Service Area Boundary can receive water from IID. Land outside of the AAC Service Area Boundary can receive water from IID only if IID agrees to sell or lease conserved water pursuant to a water conservation and transfer agreement. While these supplies are subject to even more constraints and approvals under the terms of the Quantification Settlement Agreement (QSA) and various other related contracts, IID's Board of Directors is on record as indicating that they are not in favor of any additional or new water transfers. A map of the IID service area can be accessed from the Imperial Irrigation District website at: http://www.iid.com/Modules/ShowDocument.aspx?documentid=4680. Though specific **L3-2**

project inquiries should be directed to the IID's Water Department, a quick rule of thumb is that projects within the Imperial Unit (designated by the darker green area/hash marks on the map) are generally eligible to receive water. Lands within other IID units (the yellow areas on the map) may, under certain limited conditions, be eligible to receive water although additional approvals and processes would likely be required. Lands outside IID units may not receive water. Project proponent should contact the IID Water Supply Planning-Colorado River & QSA Issues Manager at (760) 339-9038 for additional information. **L3-2, cont.**

3. On page 3.20-14, 3.20 Affected Environment-Water Resources Chapter, State Subsection, the document states: *"The IID Plan [the Integrated Water Resources Management Plan] addresses the entire IID service area, including the Proposed Action site, and includes thorough analysis of future water supply and demand requirements, including increasing water demands associated with projects such as the Proposed Action. Therefore, as relevant to SB 610, the IID Plan is considered equivalent to an UWMP [Urban Water Management Plan]."* The IID plan is in draft form and should not be considered an UWMP since it is has not been adopted. Beyond this fact, it is appropriate, in a general sense, for the project proponent to use the document as a planning tool or summary of projected supply/demand conditions. Furthermore, the IID Plan has no implementation activities associated with it, so the text of this Subsection as well as the Environmental Consequences-Water Resources Chapter, Groundwater Supply and Recharge Subsection on page 4.19-4, 4.19 should be revised. **L3-3**

4. Any new, relocated, upgraded or reconstructed IID facilities required for and by the project (which can include but is not limited to electrical utility substations, electrical transmission and distribution lines, etc.) need to be included as part of the project's CEQA and/or NEPA documentation, environmental impact analysis and mitigation. Failure to do so will result in postponement of any construction and/or upgrade of IID facilities until such time as the environmental documentation is amended and environmental impacts are fully mitigated. **Any and all mitigation necessary as a result of the construction, relocation and/or upgrade of IID facilities is the responsibility of the project proponent.** **L3-4**

Should you have any questions, please do not hesitate to contact me by phone at 760-482-3609 or by e-mail at dvargas@iid.com. Thank you for the opportunity to comment on this matter.

Respectfully,

Donald Vargas
Environmental Specialist

Carlos Villalon – Manager, Water Dept.
Mike L. King – Manager, Water Dept.
Jeff M. Garber – General Counsel
Juan Carlos Sandoval – Asst. Mgr. Energy Dept.
Joel Ivy – Asst. Mgr. Energy Dept.
Carlton L. King – Asst. Mgr., Energy Dept. Customer Service Operations
Tina Shields – Asst. Mgr., Water Dept. Resources Planning & Management
David L. Barajas – General Supt., Energy Dept. System Planning & Engineering
Michael S. Trump – General Supt., Energy Dept. Customer Operations & Planning
Ismael Gomez – Chief Engineer, Water Dept. Engineering Services
Bruce Wilcox – Environ. Proj. Mgr., Water Dept. QSA Water Transfer
James P. Kelley – Supervisor, Real Estate & Right-of-Way
Vikki Dee Bradshaw – Asst. Supv., Environmental Management

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Date: September 28, 2011

To: Mrs. Angelina Havens
IC Planning and Development Services

SUBJECT: 674-OCOTILLO EXPRESS LLC

The Imperial County would like to thank you for the opportunity to comment on this project. Listed below you will find out comments and or suggestions.

1.) The first comment is based on the height of the structures alone. These wind turbine structures would obviously be the largest structures in this remote area, presenting a challenge for both rescue and fire operations. A recommendation would be to have training made available to ensure that fire staff is properly trained for high angle rescue and fire operations. **L4-01**

2.) These structures are located on remote roadways that may have obstructed or limited width on access ways. This would require our agency to have specialized equipment, which is not readily available at this time to handle such emergencies in this area. **L4-02**

3.) In the plan it states that the supervisors will ensure that personnel have shovels, fire extinguishers and first aid kits on site. This is an excellent idea; however, these will not always be available after construction and at all hours of the day. This will then be the responsibility of the local fire agency (Imperial County Fire Department). **L4-03**

The Imperial County Fire Department looks forward to working with everyone on this project. However, this agency must ensure that all areas of safety are addressed and or have a mitigated measure in place to properly respond to any and all emergencies. **L4-04**

If you should have any questions and or comments, feel free to contact me at (760) 482-2422.

Thank you

Respectfully submitted,

Tony Rouhotas Jr.
Fire Chief/OES Coordinator

An Equal Opportunity / Affirmative Action Employer

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AIR POLLUTION CONTROL DISTRICT

October 6, 2011

Mr. Cedric Perry, Project Manager
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

SUBJECT: Draft Environmental Impact Report (DEIR) for Ocotillo Express Wind Energy Project.

Dear Mr. Perry,

The review of the Draft EIR for the proposed Ocotillo Express Wind Energy Project has been finalized by the Imperial County Air Pollution Control District (Air District). The Air District would like to thank you for allowing us to comment on your project. The Applicant proposes to construct, operate, maintain, and decommission the proposed OWEF, an up to 465 MW wind energy facility in on approximately 12,436 acres in Imperial County, CA near the unincorporated community of Ocotillo. The project would be located on BLM-adiministered land except for approximately 26 acres of private land near the center of the proposed OWEF site. Additionally, 487 acres of private and public land outside the project boundaries would be utilized for road access and collection line ROW's.

On page 3.2-2 table 3.2-3 provides the attainment status of the project area. Keep in mind that the Imperial County's determination of the 1997- 8-Hour NAAQS, on December 3, 2009, the U.S. EPA made a final determination that the Imperial County attained the 1997 8-Hour National Ambient Air Quality Standard (NAAQS) for Ozone (FR Vol. 74, No. 231, Page 63309) and was approved by the California Air Resources Board on November 18, 2010. However, Imperial County's classification and designation status remains as a "moderate" non-attainment area for the 1997 8-hour ozone NAAQS. In addition, in respect to the PM10 SIP, the Imperial County Air Pollution Control District Board of Directors adopted the PM10 SIP on August 11, 2009. In addition, on October 8, 2009, U.S. EPA issued a final Federal Register notice designating the Imperial County as "nonattainment" for the 24-hour $PM_{2.5}$ NAAQS. **L5-01**

On page 3.2-4 table 3.2-3 is explains the attainment status in detail. However, please modify this section per the information provided above. L5-02

On page 4.2-4 there is a statement that "The Applicant provided an assumption that 10 percent of the new unpaved roads would require annual re-grading." The Air District does want to make clear that Rule 805 – Paved and Unpaved Roads section E.3 says that The construction of any new Unpaved Road is prohibited within any area with a population of 500 or more unless the road meets the definition of a Temporary Unpaved Road. The Temporary Unpaved Road shall meet the definition of a Stabilized Unpaved Road as determined by the test methods in Rule 800, Appendix B, Section C, and where VDE is limited to 20% opacity. L5-03

On page 4.2-6 the language under AR-2 and AR-3 "the proposed project would have temporary significant and unavoidable NOx and PM10 impacts during construction." is an incorrect statement and should be stricken of the Final EIR. With the implementation of including but not limited to the Air Districts CEQA Air Quality Handbook and its Rules and Regulations, such as Regulation VIII, and the required permits as stated on page 3.2-7 will help a project reduce its excess emissions. L5-04

On page 4.2-19 please refer to the above comment and rephrase the statements "the proposed project would have temporary significant and unavoidable NOx and PM10 impacts during construction." L5-05

In closing, according to records obtained by the Engineering department, the applicant for Ocotillo Express Wind Energy Project has not submitted an Authority to Construct (ATC)/Permit to Operate (PTO) application to the Air District for review. Please schedule a meeting with the Air District's Engineering Department for further information. Any additional issues will be addressed during the permit review period. L5-06

The Air Districts' rule book, including all new regulations can be accessed via internet at http://www.Imperialcounty.net under "Air Pollution Control." Once again, Thank you for allowing the Air District an opportunity to comment on this project. Should you have any questions please do not hesitate to call the office at (760)482-4606.

Sincerely,

Belen Leon

Belen Leon
APC Environmental Coordinator

Cc: Brad Poiriez, APCO
Monica Soucier, Planning Division Manager

ERIC GIBSON
DIRECTOR

County of San Diego

DEPARTMENT OF PLANNING AND LAND USE

5201 RUFFIN ROAD, SUITE B, SAN DIEGO, CALIFORNIA 92123-1666
INFORMATION (858) 694-2960
TOLL FREE (800) 411-0017
www.sdcounty.ca.gov/dplu

October 6, 2010

Cedric Perry, Project Manager
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, California 92553
Sent Via Email: cperry@blm.gov

COMMENTS ON OCOTILLO EXPRESS WIND ENERGY PROJECT DRAFT EIR/EIS

Dear Mr. Perry:

The County of San Diego has received and reviewed the Draft Environmental Impact Report and Environmental Impact Statement (EIR/EIS) for the Ocotillo Express Wind Energy Project dated June 2011 and appreciates this opportunity to comment. In response to the document the County, as a possible responsible agency under CEQA Section 15381, has comments that identify potentially significant environmental issues that may have an effect on the unincorporated lands of San Diego County. County Department of Planning and Land Use (DPLU) staff has completed their review and has the following comments regarding the content of the above document:

GROUNDWATER RESOURCES

Page 2-9, Utilities. The proposed project is intending on obtaining 50-acre feet of groundwater from a private well owner in Pine Valley within the unincorporated portion of San Diego County. The sale of groundwater from a private well owner is defined as a "Groundwater Extraction Operation" within the Zoning Ordinance (Sections 1810, 6552, and 6654) of San Diego County and would require obtaining a Major Use Permit from the County. Therefore, without the private well owner obtaining a Major Use Permit from the County of San Diego, this project does not have a legal groundwater source from a private well in Pine Valley or for that matter anywhere within the jurisdiction of the County of San Diego. The County of San Diego strongly recommends removing this water source from the document and securing an alternate legal water source unless a Major Use Permit is obtained. **L6-01**

In addition, the Major Use Permit would not be recommended unless a groundwater investigation report meeting County of San Diego standards demonstrates that the project can pass County Groundwater Ordinance requirements and there would be a less than significant impact to groundwater resources pursuant to CEQA. Since it is unknown where the private well owner is located, it is not possible to accurately comment on specific local groundwater issues that might be associated with this proposal. Pine Valley, similar to the project site for this project, is completely groundwater dependent and have no other source of water should groundwater problems develop. A recent Groundwater Study for Pine Valley as part of the recent General Plan Update indicates an additional 50 acre-feet of groundwater production would be on the outer limits of what would be sustainable if water were removed from the South Pine basin. The study can be found as Appendix X at the following link: http://www.sdcounty.ca.gov/dplu/gpupdate/docs/BOS_Aug2011/EIR/Appn_D_GW_Appendices.pdf **L6-02**

The County of San Diego appreciates the opportunity to comment and to continue to participate in the environmental review process for this project. We look forward to receiving future environmental documents related to this project or providing additional assistance at your request. If you have any questions regarding these comments, please contact LeAnn Carmichael at (858) 694-3739 or email at leann.carmichael@sdcounty.ca.gov.

Sincerely,

ERIC GIBSON, Director
Department of Planning and Land Use

cc: Adam Wilson, Policy Advisor, Board of Supervisors, District 2 (via email)
Megan Jones, CAO Staff Officer, DCAO, (via email)

VIEJAS
TRIBAL GOVERNMENT

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Anthony R. Pico, Chairman
Robert Cita Welch, Vice Chairman
Anita R. Uqualla, Tribal Secretary
Samuel Q. Brown, Tribal Treasurer
Greybuck S. Espinoza, Councilman
Victor E. Woods, Councilman
Raymond "Bear" Cuero, Councilman

Phone: 6194453810
Fax: 6194455337
viejas.com

March 3, 2011

Iain Fisher, CPUC
Greg Thompson, BLM
C/O DUDEK
605 Third Street
Encinitas, CA 92024

RE: Additional Comments by the Viejas Band in Support of the Manzanita Band of the Kumeyaay Nation Concerns for Protection of the Golden Eagle and Protection of Kumeyaay Ancestral Sites.

Dear Mr. Fisher and Mr. Thompson,

The Viejas Band of Kumeyaay Indians, (appearing in the U.S. Federal Register at Vol. 75, No. 190, p. 60810 as the Viejas (Baron Long) Group of the Capitan Grande Band of Mission Indians of the Viejas Reservation, California) is a self-governing federally recognized Indian Tribe exercising sovereign authority over the lands of the Viejas Indian Reservation.

The Viejas Band supports the Manzanita Government's request concerning the protection of the Golden Eagle population in the region and protecting significant cultural, historic, religious, or archaeological Kumeyaay ancestral sites in the region from negative impacts.

N1-01

The Viejas Band supports the Manzanita Government's request for additional study prior to the approval of the EIR/EIS as the current environmental documents lacks adequate protection for the Golden Eagle and lacks protective measures for the significant ancestral Kumeyaay sites in the project areas.

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The Viejas Band agrees "the Golden Eagle is an essential religious and spiritual co inhabitant of the land with the Kumeyaay people. This relationship dates back to before recorded time. Over the past several decades the total population of the eagles in the region has been documented as significantly declining." In addition, "the primary reason for the decline in eagle population is due to the influx of human disturbance to and around the core nesting areas and foraging territories necessary to sustain a healthy eagle population."

The Viejas Band supports the Manzanita Governments request for the development of an Avian Protection Plan in conjunction with the proposed project and supports the Manzanita Band of the Kumeyaay Nation stands against any and all projects that endanger the Golden Eagles of the region and stands against any project that negatively impacts any of the last significant Kumeyaay ancestral districts left on earth.

N1-01, cont.

Sincerely,

Anthony R. Pico, Chairman
Viejas Tribal Council

cc: Manzanita Band of the Kumeyaay Nation

Comment Letter N2

VIEJAS
TRIBAL GOVERNMENT

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Anthony R. Pico, Chairman
Robert Cita Welch, Vice Chairman
Anita R. Uqualla, Tribal Secretary
Samuel Q. Brown, Tribal Treasurer
Greybuck S. Espinoza, Councilman
Victor E. Woods, Councilman
Raymond "Bear" Cuero, Councilman

March 3, 2011

Mr. Iain Fisher, California Public Utilities Commission
Mr. Greg Thomsen, Bureau of Land Management
c/o Dudek
605 Third Street
Encinitas, CA 92024

Re: DEIS Comments-- ECO Substation; Tule Wind Project; ESJ Gen-Tie Project

Dear Mr. Fisher and Mr. Thomsen:

Please accept this letter on behalf of the Viejas Band of Kumeyaay Indians as our comments to the record for the Draft Environmental Impact Statement ("DEIS") for the East County Substation ("ECO Substation"); Tule Wind Project ("Tule Wind"; and the Energia Sierra Juarez Gen-Tie Project ("ESJ Gen-Tie"), collectively referred to as the project.

First, Viejas appreciates the opportunity to comment, and emphasizes the importance of meaningful consultation on a government-to-government basis with local Indian tribal governments. Unfortunately, however, BLM appears to begin its consultation much later in the process than it should, and fails to conclude the consultations prior to making decisions on the projects. As a result, tribal concerns are not given the level of consideration that is required by federal statutes or policies. As Viejas has stated in our Sunrise Powerlink comments, we strongly recommend that meaningful consultation occur before project approvals are given so that tribal concerns can be addressed through project design, and mitigation measures acceptable to the tribe can be developed with their input.

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Second, while it may not be appropriate in the DEIS to inform the tribes as to the results of the ongoing consultation, periodic updates from the lead agency on the results of the consultation would be helpful. We understand that the Project is not part of the Sunrise Powerlink Project, about which we have extensively commented, but we do understand that the Project will interface with it. That Sunrise Powerlink is not a component of the current Project does not excuse its impacts from being considered as a part of the cumulative impacts of the Project, and we recommend that the DEIS be revised to better reflect this analysis.

Cultural resource studies that have been completed so far on this and the Sunrise Powerlink project have revealed the existence of thousands of recorded archaeological sites in San Diego and Imperial Counties. The cultural resources inventory report for the Project alone included approximately 200 "new" (previously unrecorded) sites, and confirm the existence of the Kumeyaay people in what is now San Diego and Imperial Counties for at least 10,000 years. The report notes a number of village sites, with at least one containing possible cremated human remains.

N2-01, cont.

Missing from the DEIS analysis are maps (which should be confidential and provided only to interested tribes) that show the location of each of the sites identified in the report and, most importantly, their relationship to one another. As confirmed by the cultural resource inventories for all the planned energy projects, these sites lie within an extensive corridor utilized by Kumeyaay peoples to travel throughout their aboriginal homelands. Individual recorded sites cannot be adequately understood if viewed as discrete and isolated from another; rather, the sites must be considered in relationship to one another. If viewed from the tribal perspective, these sites will likely be seen as larger village sites and the village sites as part of larger cultural complexes and should be evaluated accordingly. Without this information, tribes cannot make informed comments or recommendations.

Also missing from the cultural resources information in the DEIS is information about the presence and the extent of participation of Native American monitors in the studies. Neither the Draft Cultural Resources Inventory Report, nor the information in the DEIS appear to include any input by monitors who may have been present, nor do they appear to incorporate any tribal cultural values in the assessment of the sites. While we understand that the requirements of National Register of Historic Places (NRHP) and

California Registry of Historic Resources (CRHR) criterion for evaluating archaeological sites for significance are specific, Viejas nonetheless believes and encourages archaeology professionals to include in their significance and eligibility assessments under criterion A/1 tribal cultural values, which would only serve to enhance the analysis and evaluation of any given site. Often times, such assessment can be done by examining existing collections and information, without the need for additional excavation that could disrupt the site.

Viejas notes in the DEIS that a number of sites are potentially eligible for listing. We recommend that those sites be evaluated for significance and listed on both the NRHP and CRHR and that the research design should be developed in consultation with tribes. We further strongly recommend avoidance of all sites that are either potentially significant or are significant because these sites are irreplaceable and no acceptable mitigation exists other than complete avoidance.

The mitigation, monitoring, compliance and reporting measures ("MMCR") in the DEIS for cultural resources are inadequate. Currently a Historic Properties-Cultural Resources Treatment Program ("HPCP-CRTP") is to be developed among all federal, state, and local agencies. The development of the HPCP-CRTP should occur in meaningful and timely consultation with the tribes, rather than be developed and then presented to the tribes for comment as is presently stated. Additionally, as stated in the MMCR, Native American monitors would be required only at culturally-sensitive locations specified by the lead agency. Viejas' recommendation is that, given the number of "new" sites discovered during the initial survey, qualified, knowledgeable Native American monitors should be present during any additional surveying and any ground disturbing activities to ensure the proper documentation and treatment of inadvertent cultural resource discoveries. Given the cultural resources survey information, it appears highly likely that additional sites will be found.

N2-01, cont.

The MMCR also requires monitoring by a qualified archaeologist in areas of the Project deemed sensitive for cultural resources, because significant portions of the Project site contain sedimentary deposits that have the potential to contain buried cultural resources. We agree that monitoring should take place, but that a qualified, knowledgeable Native American monitor should be on site as well. We further recommend that the archaeologist, in consultation with the Native American monitor, evaluate and determine the appropriate treatment for the inadvertent discovery of cultural resources during construction.

Finally, given the large scale of the Project and the significant impacts it will have on natural and cultural resources, Viejas recommends that biological components of the Project be inventoried, and that a photo recordation of the landscape be made. The landscape and its individual components are inextricable features to the tribal cultural resources found at each place, and the landscape itself is of significance to the cultural and historical understanding of the Kumeyaay heritage. If it has not been done, a cultural landscape assessment for the project area should be completed before project approval.

N2-01, cont.

Thank you for your attention to the matter. We would appreciate a response to this letter to inform us of the mitigation measures you will adopt. If you have any questions or concerns, please contact either Lisa Haws at 619-659-2341 or Kimberly Mettler at 619-659-2441.

Sincerely,

Anthony R. Pico, Chairman
Viejas Band of Kumeyaay Indians

Comment Letter N3

VIEJAS
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Robert Cita Welch, Vice Chairman
Anita R. Uqualla, Tribal Secretary
Samuel Q. Brown, Tribal Treasurer
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Victor E. Woods, Councilman
Raymond "Bear" Cuero, Councilman

August 25, 2011

Bureau of Land Management
Attn: Margaret Goodro, Field Manager
1661 South 4th Street
El Centro, CA 92243

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IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

Re: Renewable Energy Projects: Ocotillo Express

Dear Ms. Goodro:

On behalf of the Viejas Band of Kumeyaay Indians, I am writing to express our serious concerns about this and other proposed renewable energy projects planned for the Imperial Valley desert. Specifically, the Band is concerned about the failure of the BLM, the federal lead agency, to engage in meaningful consultation with Indian Tribes and the inadequacy of the Draft Environmental Impact Report (DEIR) that has been released for public comment. **N3-01**

With regard to consultation, the BLM as a lead agency has an obligation under Section 106 of the National Historic Preservation Act (and other authority) to engage Tribes in meaningful consultation. This obligation is not discharged by simply sending a letter of information or meeting with Tribes for consultation and doing no more at that meeting than requesting that tribal concerns be submitted to the BLM in a letter. Instead, the BLM should be actively engaged in outreach to affected Tribes, especially given the number of proposed projects in this area. The BLM should also be actively engaged in ongoing efforts to develop working relationships with the Tribes and finding ways in which Tribal concerns - not the concerns of archaeologists alone - can be meaningfully considered and integrated into environmental and land use planning analysis. **N3-02**

Furthermore, critical to meaningful consultation is timely, accurate, and adequate information. It is our understanding that—aside from Sunrise Powerlink, Tule Wind and Ocotillo Express—there are approximately 100 or more proposed projects being considered for the Imperial Valley and those projects will be interconnected with each other and Powerlink, Tule Wind and Ocotillo Express. Information provided by the BLM to the Tribes is not helpful in informing Tribes of those other projects or their project status as informational letters are spread over a long period of time and are not explicit about cumulative impacts. Additionally the notices on the numerous projects are often confused with one another because no effort has been made by the BLM to provide a comprehensive picture of what is planned for this area and for Eastern San Diego County. Further, the BLM has failed to respond to our comments in writing or otherwise, and the BLM has not provided any information to us regarding consultation meetings with other Tribes and their outcomes. This compartmentalization of consultation and information is unworkable and unacceptable. N3-03

With regard to the DEIR, its purpose is to evaluate the potential impacts of a proposed project and its alternatives. Viejas struggles to understand how such an evaluation could take place when field surveys identifying Tribal cultural resources have not been completed as of the date the DEIR was released. During the course of the Tribal cultural resources surveys, the research plan and protocol was changed without notice or consultation to the Tribes. In fact, neither Tribes nor their cultural resource monitors were consulted in the field on any aspect of the identification, value, meaning, or purpose of tribal cultural resources located in the field. No cultural landscape study or ethnography has been completed or even planned. All of these things are necessary and should be required *as a part of* the Tribal cultural resources inventory and evaluation (which should have been part of the DEIR) in order to appropriately evaluate the impacts of the proposed project and its alternatives. This information is critical to the Tribes as well, because when combined with our knowledge of this area and the insights of our Tribal cultural monitors, elders and spiritual leaders, both the BLM and the Tribes will have what is necessary to form an informed, well-considered evaluation of the project impacts and will be better situated to work together to determine whether adequate mitigation can occur. N3-04

On a related note, a number of people from California and Arizona Tribal nations have visited the area and have participated in ceremonies as they have done for a number of N3-05 years. It was brought to our attention that areas where these Tribal cultural resources—including cremations and human remains—are located are within public use areas of the Imperial Valley. The concern to us is that the public use areas are dangerously close to many of the resources and it is clear from the current disturbances of some of these resources and the garbage found near them that the BLM is not discharging its duty to properly manage and protect these resources as it is. As a result, we are concerned that the BLM would be further unable to discharge this duty if the proposed projects are approved and additional public access occurs due to the new access roads that are part of the project design.

N3-05, cont.

Finally, this project requires an amendment to the California Desert Conservation Area Plan (the "Plan"). The Tribes trusted that the designations of the Plan for this area "Class L - Limited Use" would remain. This use designation is to promote and maintain open space and biological and cultural resources values. Instead, the applicant wants this decades-old Plan, upon which we as Tribal nations relied, to be changed with a stroke of a pen to allow industrial uses to occur on these open space lands. There has been inadequate public discussion about these land use amendments and the Viejas Band is strongly opposed to such amendments as it amounts to nothing more than spot zoning (a disfavored land use practice) and privatization of our sensitive public lands.

N3-06

The BLM as a federal agency has a trust responsibility not to the project applicants and their proponents, but to Indian Tribes. Part of this responsibility is to engage Tribes in a meaningful and informed way, and provide them an opportunity to fully participate in the NEPA process. While it is true that in recent days it appears this nation's priority is the development of renewable energy projects, this does not negate the obligations the federal government has to Indian Tribes, which includes consultation. The number of proposed projects and the speed with which they are being analyzed and approved is alarming because the full impact of these projects - individually and collectively - is not being adequately evaluated, and therefore cannot be fully understood.

N3-07

The Viejas Band requests that the application process for the Ocotillo Express project and all other proposed projects be postponed and/or altogether stopped until all interested parties, including Indian Tribes, are provided comprehensive information about the projects and have reasonable time to adequately evaluate the project impacts and provide comment. Furthermore, information should be provided to all interested

N3-08

parties as to the cumulative impacts of these multiple projects on biological and cultural resources, as well as the cultural landscape and viewshed. Until this information is provided, neither Indian Tribes nor the public can participate in this process in any meaningful way.

N3-08, cont.

We appreciate your continued attention to this matter. Please contact my office at 619-659-2323 or Kimberly R. Mettler at 619-1710 with any questions or comments.

Sincerely,

VIEJAS BAND OF KUMEYAAY INDIANS

Hon. Anthony R. Pico
Chairman

Cc: Intertribal Cultural Resources Protection Council
Tribal Leaders
Advisory Council for Historic Preservation
Native American Heritage Commission
California State Office of Historic Preservation
County of Imperial
California Public Utilities Commission
Bureau of Land Management, Jim Kenna, State Director

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2011 SEP -2 AM 10: 53
EL CENTRO FIELD OFFICE
EL CENTRO, CA.

August 29, 2011

Bureau of Land Management
Attn: Margaret Goodro, Field Manager
1661 South 4th Street
El Centro, CA 92243

Re: Proposed Ocotillo Express

Dear Ms. Goodro:

On behalf of the Viejas Band of Kumeyaay Indians, I am writing to follow-up on a number of issues we have become aware of since our meeting on August 8, 2011.

First, Viejas is aware that at both the August 24, 2011 and August 25, 2011 public meetings for the proposed Ocotillo Express Project, the public participants were denied the opportunity to publicly and verbally submit comments to the record. Instead of allowing members of the public to openly testify on the record, participants were told to submit written comments and they would be addressed in the Final Environmental Impact document. During the August 25, 2011 meeting, at least two individuals voiced their protests. Fundamental to the environmental review process is public participation and information disclosure. By restricting the public's participation at a public hearing to merely the submission of written comments, lead agencies are limiting information that may be critical to understanding the agency's proposed actions and are ther efore knowingly relying on inadequate information in completing environmental review. In restricting information relating to its actions, the lead agencies are failing to conduct its environmental reviews in a manner reflective of the spirit, intent, and purpose of both CEQA and NEPA. As a result, Viejas is requesting that the lead agencies hold two public hearings prior to the close of the public comment period on the DEIR/S to present the information from the August 24 and 25 meetings, and allow for verbal and written public comments.

N4-01

Second, we expressed in our August 8 meeting and in the August 25, 2011 letter to you that it is difficult to understand how the Draft Environmental Impact Report (DEIR) could have been released before the cultural resources assessment reports were even completed. We learned that last week, a draft cultural resources report was released to the BLM by Tierra Environmental, that the BLM would have two to four weeks to review and comment on the draft and that the report would be returned to Tierra, which would have two weeks to revise and finalize the report. This time frame is alarming as the release of the final cultural resources report, which presumably will be subject to tribal (limited public) review, potentially will not be released until after the current DEIR public comment deadline of October 5, 2011 has closed. As a result, Viejas is requesting that the BLM extend the public comment deadline to November 15, 2011 or to such later time as will allow for adequate review and comment on the cultural resources report to be completed. You may also recall that during the August 26 site visit to the proposed project area, Viejas representatives requested a copy of the draft report that was released to the BLM. We are concerned that the BLM first affirmed that it would release the report, but later that day refused to commit to release to the Tribes. We again restate our request for a copy of the pre-draft report that was released to the BLM as well as a copy of the draft report. Both are being requested as part of the government-to-government consultation process, which has not yet occurred. N4-02

On a related note, we are aware that the principal investigating archaeologist was recently replaced and a new archaeologist will be responsible for finalizing the cultural resources report. Please be aware that Viejas objects to this change in personnel as the new principal investigator has only been on this project for a mere three weeks rather the 6 weeks that has otherwise been stated. We also understand that the August 26 site visit was only the second time the principal investigator has ever been to the project area. We are concerned that someone inexperienced with this project and the affected tribes is charged with finalizing a cultural resources survey report they have not participated in. Additionally, Viejas representatives who spoke with the principal investigator during the August 25 public meeting have conveyed to us that she believes the inclusion of tribal perspectives, experience and values into the cultural resources survey is a matter of Section 106 consultation, rather than an aspect of comprehensive cultural resources evaluation. We disagree. As previously stated, this information must be included in order to fully assess the impacts of the proposed project, as should an ethnography and cultural landscape assessment. We are opposed to the archaeological perspective being the only perspective on which impact assessments will be based. N4-03

Further, the new principal investigator characterized the over 300 recorded cultural resources sites to my staff as being only lithic scatters, chipping stations and a few pottery scatters. She misstated the number of human remains positively identified so far in the project area, and characterized the significance of the found pottery to be nothing more significant than the lithics. Such statements indicate to us a lack of knowledge of the work completed to date, and a lack of knowledge of tribal cultural resources and history of the peoples of the Southern California coast, desert and mountains. This type of knowledge and experience is critical in completing a technical report of this nature. We are concerned that such lack of knowledge will enhance mischaracterizations and misinformation of the tribal cultural resources located within the proposed project area, particularly in light of the absence of tribal values. Finally, the new principal investigator stated that the information from tribal monitors would not be incorporated into the archaeological report. We object, as we firmly believe that tribal monitor's view of the resources in the field - their ancestors' resources - is highly relevant information that informs an archaeological assessment. **N4-04**

Third, Viejas appreciates the site visit with the BLM to view some of the sites in the proposed project area. What is more informative; however, is accurate information provided about the site visits including maps and visits to the areas of direct impact. During the August 26 site visit, the BLM intended to show five sites to Viejas representatives; these five sites are recommended as eligible for listing on the National Register of Historic Places. We appreciate the opportunity to visit them; however, our greater concern is visiting the sites that would potentially suffer a direct impact from this project. None of the sites planned for the visit were within the direct impact area, but we cannot be sure as the map provided to us for this visit was incorrect. It was noted during the visit that the map we were provided showed recorded sites and the locations of the turbines to be located nearest them. However, upon further questioning of BLM staff, it was discovered that the turbines depicted on the maps were not correctly located and were ultimately discovered to be moved away from one tribal cultural resource and impacting another. Such an error calls into question the accuracy of other maps that have been shown to Viejas and other interested parties. **N4-05**

Finally, we are aware that members of the BLM El Centro office staff have stated on more than one occasion (most recently on August 25) that this project will be approved. **N4-06**

Such a statement, when combined with the lack of consultation with Tribes, the restriction on public participation in the environmental review process, the release of the DEIR prior to the completion of at least one technical report on which the DEIR is based, supports speculation that the BLM is acting as a proponent of the proposed project, rather than an impartial federal agency charged with managing and protecting public resources and the public trust. Furthermore, such statements indicate the lack of impartiality on the part of the lead agency's key staff, and noncompliance with the letter and spirit of federal law, regulations, and policy. **N4-06, cont.**

Thank you for your attention to this matter. Viejas looks forward to receiving the draft report provided to you by Tierra Environmental no later than September 5, 2011. If you have any questions, please contact my office at 619-659-2323 or Kimberly R. Mettler at 619-659-1710. **N4-07**

Sincerely,

VIEJAS BAND OF KUMEYAAY INDIANS

Hon. Anthony R. Pico
Chairman

cc: Bureau of Land Management, Jim Kenna, State Director
County of Imperial
Tribal Leaders
Intertribal Cultural Resources Protection Council
Advisory Council for Historic Preservation
Native American Heritage Commission
California State Office of Historic Preservation
California Public Utilities Commission
Protect Our Community Foundation

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IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

August 31, 2011

Bureau of Land Management
Attn: Margaret Goodro, Field Manager
1661 South 4th Street
El Centro, CA 92243

Re: Renewable Energy Projects: Ocotillo Express

Dear Ms. Goodro:

On behalf of the Viejas Band of Kumeyaay Indians, I submit this letter as a follow-up to our August 8, 2011 meeting with you and members of your staff. As you recall the meeting was hosted by Viejas, and included representatives from the Campo and Manzanita Bands of Mission Indians. We appreciate your time in meeting with us, and intend here to summarize the meeting and to submit our written request for the information we asked for at the meeting. **N5-01**

Viejas expressed that we are disturbed by what is going on in the Imperial Desert and a goal to preserve and protect the tribal cultural resources that exist there. We also expressed the failure of the BLM to understand the depth and breadth of the value these places have to us and our spiritual connection to them. I personally expressed to you and the other staff that despite claims by representatives of public agencies and their cultural resource management consultants, these places have not been "abandoned" by the Native people. Rather, we were forced away from these places under threat of attack and death. We want people to know that we were here. **N5-02**

We asked a number of questions of BLM staff. For example, relative to Ocotillo Express, we asked about the status of the cultural resources survey and were told that the BLM expects it to be completed in time for the release of the Final Environmental Impact Report/Statement (FEIR/S). **N5-03**

You requested that we submit to you in writing the spiritual connections we have to these places. Viejas asked how the tribal consultation information was shared and you responded that it would be included in the cultural resources report. **N5-04**

Viejas asked how the DEIR could be released when the cultural resources surveys that were the basis for the report were not even concluded. We further informed you that neither cultural monitors nor archaeologists had been allowed to survey within the areas of direct impact, about which your staff claimed no knowledge, and we informed you that the process for recording had been changed without consultation or notification to the tribes. Rather than provide a direct answer to our question or directly respond to our comments, we were directed by you to put our concerns in a letter to the BLM. In fact, many of the responses to our concerns were the same. **N5-05**

Viejas and other tribal representatives (Campo and Manzanita) expressed to you concerns that the project will create increased access to cultural resources in the desert. One representative reminded you that the trust obligation of your agency is to tribes and not the project applicant; consultation is required by law but preservation of these resources is a trust obligation. We also questioned why the project had been reconfigured with no input from the tribes. BLM staff insisted that consultation had been ongoing, with which we disagreed, and stated that these comments had been heard before from the tribes and were ongoing concerns of the tribes. We were told, as were apparently the other tribes, to make sure our concerns were included in comment letters. When asked what impact that would have and how our concerns were to be addressed, no answer was forthcoming from BLM. **N5-06**

As we have stated a number of times in face-to-face meetings, site visits, and in correspondence, Viejas does not agree that meaningful consultation has taken place to date. We have not been invited to consult in the development of the cultural resources survey methodology; we have not been invited to consult in the interpretation or correct characterization of cultural resources in the field—in fact, when offered to your consultants in the field that information was ignored, and the exclusion of that information confirmed by the new principal investigator at the August 25 public meeting. We have not been consulted with regard to eligibility recommendations for listing on the National Register for some of the sites within the project area. We have not been consulted regarding the need for a cultural landscape assessment or an ethnography of the area or even what that might entail. **N5-07**

We understand that your consultant provides a certain level of expertise on tribal cultural resources.. However, no amount of expertise on their part can exceed the knowledge and understanding of these resources than the Native Peoples of Southern California themselves. Knowledge of these places and items and their purposes, roles and values to our people are conveyed in stories,.songs, and ceremonies that are told, sung and practiced today. We know how our people travelled from the coast, through the deserts and into the mountains. We know how they celebrated and how they grieved. What is listed in the site records and in some of the materials on which your consultants rely isn't necessarily correct. Meaningful consultation under the law requires you to seek and incorporate our knowledge and values into the environmental review process. Meaningful consultation under the law requires you to address our concerns and questions and to work with us to find a workable solution, rather than direct us to put them in a letter to you and then be ignored. **N5-08**

During our August 8, 2011 meeting we requested a number of items. We would again like to request the following relative to Ocotillo Express: **N5-09**

1. Maps that show the location of the tribal cultural resource sites, their relationship to each other and to the proposed project.
2. Reassurances that qualified, knowledgeable tribal cultural monitors are assigned to each of the consultant's teams that are working in the field.
3. Information about how the BLM will insure that tribal values and views are incorporated into the FEIR and other evaluations of tribal cultural resources.
4. The completion of a cultural landscape assessment.
5. Arial photos of the project area.
6. The completion of a comprehensive ethnographic report, including video of the interviews.

We would again like to request the following relative to renewable proposed for the Imperial Desert in general:

1. A map that shows all the renewable energy projects being proposed for the Imperial Valley, that have been approved for the Imperial Valley or that are under construction in the Imperial Valley.
2. A comprehensive map that shows all the tribal cultural resources that have been discovered for ALL renewable energy projects in the Imperial Valley including Imperial Valley Solar (West and South); Sunrise Powerlink, Ocotillo Sol; Tule Wind and Centrinela Solar.

N5-10

Viejas looks forward to receiving this information, and we appreciate your attention to this matter. Please contact my office or Kimberly R. Mettler at 619-659-1710 with any questions.

Sincerely,

THE VIEJAS BAND OF KUMEYAAY INDIANS

Hon. Anthony R. Pico
Chairman

cc: Tribal Leaders
Secretary Salazar, Dept. of Interior
Secretary Chu, Dept. of Energy
Bureau of Land Management, Jim Kenna, State Director
County of Imperial
Intertribal Cultural Resources Protection Council
Advisory Council for Historic Preservation
Native American Heritage Commission
California State Office of Historic Preservation
California Public Utilities Commission

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September 9, 2011

Ken Salazar, Secretary
U.S. Department of Interior
1849 C Street, N.W.
Washington DC 20240

Re: Request for Denial of Proposed Tule Wind and Ocotillo Express Wind Projects
San Diego and Imperial Counties, California

Dear Secretary Salazar:

On behalf of the Viejas Band of Kumeyaay Indians, a federally-recognized tribe, I am writing to respectfully request that the Department of Interior deny two proposed projects on federal public lands within our Kumeyaay Ancestral Homeland: the proposed Tule Wind Project and the proposed Ocotillo Wind Express Project. Each of these projects would cause permanent, irreparable and unacceptable harms to tribal heritage resources. Viejas' letters to the federal lead agency, the Bureau of Land Management, regarding our concerns about these projects are attached, for you to see in more detail our specific concerns. **N6-01**

Relative to Tule Wind, the BLM has not addressed Viejas' concerns regarding tribal cultural resource survey and documentation. Viejas has also expressed serious concerns regarding lack of meaningful consultation and unacceptable and unmitigated impacts to the rural cultural landscape/viewshed and sacred golden eagle populations. Moreover, given that we understand the project may require a General Plan amendment from the County of San Diego, SB 18 consultations between the County and Viejas relative to the project would be required; for the federal government to approve this project while those required consultations have neither been initiated nor completed, risks inconsistent project outcomes. Given the lack of seriousness with which the BLM has taken each of our concerns, Viejas is left with no option but to request your denial of this and its related projects.

Regarding Ocotillo Express, the BLM has not addressed Viejas' concerns regarding tribal cultural resource survey and documentation. Viejas has also expressed serious concerns regarding lack of meaningful consultation and unacceptable impacts to the cultural landscape/viewshed and anticipated from **N6-02**

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increased public access on the project's new, proposed roads. Again, it appears that the BLM is concerned only with those impacts it alone classifies as directly impacting a cultural site - ignoring the myriad indirect, cumulative and landscape-level impacts Viejas - and other tribes - have repeatedly identified to the BLM and the applicant. Moreover, these lands are designated Class L - Limited Use - in the California Desert Conservation Area Plan; meaning, that our Tribe relied on the federal government's word that these lands would be maintained as open space, to promote and maintain cultural resource values. Given the trajectory the BLM appears headed on this proposed project, it is likely that Viejas will have no choice but to maintain its position that Ocotillo Express must be denied.

N6-02, cont.

Mr. Secretary, the situation in San Diego and Imperial Counties with energy transmission and renewable energy is out of hand. It is poised to forever change the lands of our ancestors and the irreplaceable cultural resources and places that are vital to our tribal life ways, sovereignty and self-reliance. This is our one and only homeland, we have no place else to go. These projects, as proposed, must be denied. We must work together to find more sustainable and environmentally responsible ways to meet energy needs without disregarding the views and needs of the local communities most affected by the impacts of these industrial-scale projects. I am available to directly discuss Viejas' concerns with you.

N6-03

Sincerely,

VIEJAS BAND OF KUMEYAAY INDIANS

Hon. Anthony R. Pico
Chairman

Attachments:
Letter: Viejas to BLM re Tule Wind (DEIS Comments), dated March 3, 2011
Letter: Viejas to BLM re Tule Wind (Additional Comments), dated March 3, 2011
Letter: Viejas to BLM re Ocotillo Express, dated August 25, 2011

cc:
Steven Chu, Secretary of Energy
Larry Echohawk, Assistant Secretary, Indian Affairs
Jonathan Silver, Director, DOE Loan Guarantee Program
Jim Kenna, Bureau of Land Management
Hon. Barbara Boxer
Hon. Dianne Feinstein
Hon. Bob Filner
Hon. Duncan Hunter
Hon. Dianne Jacob
Larry Myers, Manager, California Native American Heritage Commission
Wayne Donaldson, California SHPO
Eric Gibson, San Diego County DPLU Director
Angelina Havens, Planner, County of Imperial
Hon. Kumeyaay Leaders
Frank Brown, Chair, InterTribal Cultural Resource Protection Council

Comment Letter N7

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2011 SEP 30 PM 12: 13
EL CENTRO FIELD OFFICE
EL CENTRO, CA.

September 27, 2011

Bureau of Land Management
Attn: Mr James Kenna, State Director
California State Office
2800 Cottage Way, Suite W-1623
Sacramento, CA 95825-1886

Re: Ocotillo Express

Dear Mr Kenna:

On behalf of the Viejas Band of Kumeyaay Indians, I am writing to request your immediate review of the Ocotillo Wind Energy Facility Draft Environmental Impact Report As you may be aware, the public comment period closes on October 5, 2011 Viejas, other Indian tribes and members of the public have very serious concerns about the adequaoy of this document, about the direct, indirect and cumulative impacts of this project, and about the apparent plan to approve this project despite numerous objections and concerns We are also concerned with the BLM's failure to engage in meaningful consultation with Indian tribes on this matter **N7-01**

For the reasons stated above, we request that 1) the BLM hold public hearings on this project and allow the opportunity for public testimony on the record; and 2) the BLM extend the DEIR public comment period to November 15, 2011 or later to allow for thorough review and comment We appreciate your consideration of our request and your timely response **N7-02**

Thank you for your attention to this matter We may be contacted at 619-659-2323 or via Kim Mettler, General Counsel at 619-659-1710 with questions or comments

Sincerely,

Anthony R Pico, Chairman
Viejas Band of Kumeyaay Indians

cc: Margaret Goodro, BLM El Centro
Tribal Leaders
Interested Parties
Intertribal Cultural Resources Protection Council

VIEJAS
OFFICE OF LEGAL AFFAIRS

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PLANNING & DEVELOPMENT SERVICES

September 16, 2011

U.S. ARMY CORPS OF ENGINEERS,
LOS ANGELES DISTRICT, Regulatory Division
ATTN: SPL-2009-00971-MBS
6010 Hidden Valley Road, Suite 105
Carlsbad, CA 92011

Meris.Bantilan-Smith@usace.army.mil

Re: Public Notice, Ocotillo Wind Energy Facility Project

Dear Chief, Regulatory Division:

This letter is timely sent on behalf of the Viejas Band of Kumeyaay Indians, a federally-recognized tribe, in response to the general public notice of an Application for Permit from the Army Corps of Engineers for the proposed Ocotillo Wind Energy Facility Project. Viejas has serious concerns about this project, proposed within Kumeyaay ancestral territory, as recognized by California Assembly Joint Resolution 60 (August 15, 2002), oral history, and other authority.

Evaluation Factors: Tribal Concerns Detailed

As part of the Ocotillo Express LLC's Application for Permit, Viejas wanted to make your office aware of the concerns of the Tribe as described in detail in prior correspondence from Viejas. Attached, please find letters from Viejas to the Bureau of Land Management (BLM) dated August 25, 2011, and from Viejas to Department of Interior Secretary Salazar September 10, 2011. **N8-01**

Viejas' concerns about the project include many that also fall under the purview of the Army Corps and its evaluation factors: conservation, aesthetics, cultural values, land use, historic properties, cumulative and indirect impacts and the public interest and welfare of the people, among others. These concerns are shared by local tribal governments, tribal elders, public citizens, environmental groups and many others. Viejas is also concerned about ancestral human remains that have been identified and others that remain unidentified within and near the project footprint. **N8-02**

Viejas' concerns about the Public Notice's preliminary review of cultural resources include that Viejas believes the Area of Potential Effects (APE) is larger than simply the 13,200 acre public land footprint, to include sacred cultural viewsheds. Also, the referenced 1 mile buffer does not fully take into **N8-03** account the viewshed, and other cultural resources of tribal concern. Finally, it should be noted that impacts to biological species, such as the Peninsula bighorn sheep that have been observed within the area, are also a type of cultural impact that requires consideration. **N8-03, cont.**

Need for Tribal Notification and Consultation

The Public Notice states that the Corps of Engineers is soliciting comments from Indian tribes (among others). However, to Viejas' knowledge, no specific outreach to tribes has been made by the Corps to tribes, including no outreach to make them aware of the Public Notice and no invitation to consult pursuant to Executive Order 13007, and other federal authority and guidance, despite that the proposed project would adversely affect access to and ceremonial use of Indian sacred sites and adversely affect the integrity of such sites. **N8-04**

Viejas respectfully requests that the Corps re-issue is Public Notice and send it to local tribes and also that it send out invitations to initiate government-to-government consultation between the Corps and local tribes at its earliest opportunity.

Request for Public Hearing

Based on the magnitude of these project impacts, and that the project requires a controversial amendment to the California Desert Conservation Area Plan from conservation to industrial uses, Viejas respectfully requests that a public hearing be held on the Application for Permit. The need for a public hearing is further supported by the fact the federal lead agency, BLM, declined to have a traditional public hearing in which speakers offer testimony in front of agency representatives and other members of the public and which testimony is recorded and transcribed. BLM's decision was controversial, covered by the media, and needs to be remedied. **N8-05**

Insufficiency of Draft EIR/EIS

Your office should be aware that Viejas also intends to submit detailed comments on the Draft Environmental Impact Report/Statement (DEIR/EIS) that is presently out for public review. Viejas believes that, for reasons including those set out in the attached letters, the current DEIR/EIS is insufficient for the Corps to use to take action on the required permit. Particularly, the DEIR/EIS must be amended to include the analysis and results of the ongoing cultural surveys, which were not completed when the DEIR/DEIS was released for public review. **N8-06**

Overall Public Interest Is High

As mentioned above, the overall public interest in the project is high, as evidenced by the media stories on the project. Moreover, the protection of tribal sacred and cultural places is of local, state and national concern as evidenced by the area's inclusion in the California Native American Heritage Commission's Sacred Lands File and placement on the National Register of Historic Places as nationally significant (i.e., the Spoke Wheel Rock Alignment, listed on September 29, 2003, for cultural values **N8-07** including its viewshed). The National Congress of American Indians has also passed resolutions making protection of such areas a priority. N8-07, cont.

Overly Restrictive Project Purpose

The overall project purpose is described as providing a wind energy facility ranging in size from 315 MW to 465 MW in Imperial County, California. Viejas is concerned that the purpose may be too restrictive thereby not allowing for a full range of offsite alternative location(s) to be considered. Offsite alternatives, including already disturbed private lands (such as agriculture) should be considered before intact, conserved, public lands are used. Also, the project could be spread across more than one location (aggregating offsite locations). Finally, with such a narrowly drawn purpose, there may be qualifying locations in other counties or even in Mexico, having fewer impacts, that would be overlooked. All of these should be examined in the DEIR/EIS. N8-08

Additional Project Information

Viejas is also concerned about the number and variety of washes that would be impacted by the proposed project. The Corps must carefully examine the ecosystem effects of the project as well as the potential impacts to system reliability and maintenance. N8-09

The project's road network would induce public access which would in turn cause otherwise avoided direct impacts to sensitive tribal cultural resources. The DEIR/EIS does not contain adequate mitigation for this impact. Viejas is concerned about the width of construction roadways areas (up to 36-foot-wide). This width is further exacerbated by the stated additional 15-foot-wide underground collection systems infrastructure, bringing some road impact widths to over 50 feet. Disturbances for such roads would be incompatible with the aesthetics and the resources of this area and further encourage both legal and illegal public access. N8-10

Referenced Mitigation Vague and Inadequate

The proposed mitigation in the Public Notice is vague and inadequate. The referenced avoided areas may not be accurate given the propensity for wash outs and erosion events; the referenced impact minimization is overly general and lacks specificity of the purported benefits of the redesign; and the referenced compensatory mitigation location for wetland or non-wetland areas is not identified.

Viejas is also concerned about the lack of proposed mitigation in the Public Notice and the DEIR/EIS for tribal cultural resources. N8-11

Summary

In sum, Viejas is deeply concerned about the proposed project's impacts to tribal cultural, and other, resources. In addition to the requests above, Viejas would like to have a meeting on this project with your office. Finally, please place the Viejas Office of Legal Affairs on all project notices for this project. Should you have any questions, please do not hesitate to contact me directly. N8-12

Sincerely yours

Kimberly R. Mettler, Director
Viejas Office of Legal Affairs

Attachments:
Viejas letter to Bureau of Land Management, August 25, 2011
Viejas letter to Department of Interior Secretary Salazar, September 9, 2011

Copies:
Margaret Goodro, BLM Field Manager
Angelina Havens, County of Imperial, Planner
Larry Myers, NAHC
Nancy Brown, Advisory Council on Historic Preservation
Tribal Leaders
Interested Parties

VIEJAS
TRIBAL GOVERNMENT

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Robert Cita Welch, Vice Chairman
Anita R. Uqualla, Tribal Secretary
Samuel Q. Brown, Tribal Treasurer
Greybuck S. Espinoza, Councilman
Victor E. Woods, Councilman
Raymond "Bear" Cuero, Councilman

Phone: 6194453810
Fax: 6194455337
viejas.com

August 25, 2011

Bureau of Land Management
Attn: Margaret Goodro, Field Manager
1661 South 4th Street
El Centro, CA 92243

Re: Renewable Energy Projects: Ocotillo Express

Dear Ms. Goodro:

On behalf of the Viejas Band of Kumeyaay Indians, I am writing to express our serious concerns about this and other proposed renewable energy projects planned for the Imperial Valley desert. Specifically, the Band is concerned about the failure of the BLM, the federal lead agency, to engage in meaningful consultation with Indian Tribes and the inadequacy of the Draft Environmental Impact Report (DEIR) that has been released for public comment.

With regard to consultation, the BLM as a lead agency has an obligation under Section 106 of the National Historic Preservation Act (and other authority) to engage Tribes in meaningful consultation. This obligation is not discharged by simply sending a letter of information or meeting with Tribes for consultation and doing no more at that meeting than requesting that tribal concerns be submitted to the BLM in a letter. Instead, the BLM should be actively engaged in outreach to affected Tribes, especially given the number of proposed projects in this area. The BLM should also be actively engaged in ongoing efforts to develop working relationships with the Tribes and finding ways in which Tribal concerns - not the concerns of archaeologists alone - can be meaningfully considered and integrated into environmental and land use planning analysis.

Furthermore, critical to meaningful consultation is timely, accurate, and adequate information. It is our understanding that—aside from Sunrise Powerlink, Tule Wind and Ocotillo Express—there are approximately 100 or more proposed projects being considered for the Imperial Valley and those projects will be interconnected with each other and Powerlink, Tule Wind and Ocotillo Express. Information provided by the BLM to the Tribes is not helpful in informing Tribes of those other projects or their project status as informational letters are spread over a long period of time and are not explicit about cumulative impacts. Additionally the notices on the numerous projects are often confused with one another because no effort has been made by the BLM to provide a comprehensive picture of what is planned for this area and for Eastern San Diego County. Further, the BLM has failed to respond to our comments in writing or otherwise, and the BLM has not provided any information to us regarding consultation meetings with other Tribes and their outcomes. This compartmentalization of consultation and information is unworkable and unacceptable.

With regard to the DEIR, its purpose is to evaluate the potential impacts of a proposed project and its alternatives. Viejas struggles to understand how such an evaluation could take place when field surveys identifying Tribal cultural resources have not been completed as of the date the DEIR was released. During the course of the Tribal cultural resources surveys, the research plan and protocol was changed without notice or consultation to the Tribes. In fact, neither Tribes nor their cultural resource monitors were consulted in the field on any aspect of the identification, value, meaning, or purpose of tribal cultural resources located in the field. No cultural landscape study or ethnography has been completed or even planned. All of these things are necessary and should be required *as a part of* the Tribal cultural resources inventory and evaluation (which should have been part of the DEIR) in order to appropriately evaluate the impacts of the proposed project and its alternatives. This information is critical to the Tribes as well, because when combined with our knowledge of this area and the insights of our Tribal cultural monitors, elders and spiritual leaders, both the BLM and the Tribes will have what is necessary to form an informed, well-considered evaluation of the project impacts and will be better situated to work together to determine whether adequate mitigation can occur.

On a related note, a number of people from California and Arizona Tribal nations have visited the area and have participated in ceremonies as they have done for a number of years. It was brought to our attention that areas where these Tribal cultural resources—including cremations and human remains—are located are within public use areas of the Imperial Valley. The concern to us is that the public use areas are dangerously close to many of the resources and it is clear from the current disturbances of some of these resources and the garbage found near them that the BLM is not discharging its duty to properly manage and protect these resources as it is. As a result, we are concerned that the BLM would be further unable to discharge this duty if the proposed projects are approved and additional public access occurs due to the new access roads that are part of the project design.

Finally, this project requires an amendment to the California Desert Conservation Area Plan (the "Plan"). The Tribes trusted that the designations of the Plan for this area "Class L - Limited Use" would remain. This use designation is to promote and maintain open space and biological and cultural resources values. Instead, the applicant wants this decades-old Plan, upon which we as Tribal nations relied, to be changed with a stroke of a pen to allow industrial uses to occur on these open space lands. There has been inadequate public discussion about these land use amendments and the Viejas Band is strongly opposed to such amendments as it amounts to nothing more than spot zoning (a disfavored land use practice) and privatization of our sensitive public lands.

The BLM as a federal agency has a trust responsibility not to the project applicants and their proponents, but to Indian Tribes. Part of this responsibility is to engage Tribes in a meaningful and informed way, and provide them an opportunity to fully participate in the NEPA process. While it is true that in recent days it appears this nation's priority is the development of renewable energy projects, this does not negate the obligations the federal government has to Indian Tribes, which includes consultation. The number of proposed projects and the speed with which they are being analyzed and approved is alarming because the full impact of these projects - individually and collectively - is not being adequately evaluated, and therefore cannot be fully understood.

The Viejas Band requests that the application process for the Ocotillo Express project and all other proposed projects be postponed and/or altogether stopped until all interested parties, including Indian Tribes, are provided comprehensive information about the projects and have reasonable time to adequately evaluate the project impacts and provide comment. Furthermore, information should be provided to all interested parties as to the cumulative impacts of these multiple projects on biological and cultural resources, as well as the cultural landscape and viewshed. Until this information is provided, neither Indian Tribes nor the public can participate in this process in any meaningful way.

We appreciate your continued attention to this matter. Please contact my office at 619-659-2323 or Kimberly R. Mettler at 619-1710 with any questions or comments.

Sincerely,

VIEJAS BAND OF KUMEYAAY INDIANS

Hon. Anthony R. Pico
Chairman

Cc: Intertribal Cultural Resources Protection Council
- Tribal Leaders
- Advisory Council for Historic Preservation
- Native American Heritage Commission
- California State Office of Historic Preservation
- County of Imperial
- California Public Utilities Commission
- Bureau of Land Management, Jim Kenna, State Director

Comment Letter N8

VIEJAS
TRIBAL GOVERNMENT

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Victor E. Woods, Councilman
Raymond "Bear" Cuero, Councilman

Phone: 6194453810
Fax: 6194455337
viejas.com

September 9, 2011

Ken Salazar, Secretary
U.S. Department of Interior
1849 C Street, N.W.
Washington DC 20240

**Re: Request for Denial of Proposed Tule Wind and Ocotillo Express Wind Projects
San Diego and Imperial Counties, California**

Dear Secretary Salazar:

On behalf of the Viejas Band of Kumeyaay Indians, a federally-recognized tribe, I am writing to respectfully request that the Department of Interior deny two proposed projects on federal public lands within our Kumeyaay Ancestral Homeland: the proposed Tule Wind Project and the proposed Ocotillo Wind Express Project. Each of these projects would cause permanent, irreparable and unacceptable harms to tribal heritage resources. Viejas' letters to the federal lead agency, the Bureau of Land Management, regarding our concerns about these projects are attached, for you to see in more detail our specific concerns.

Relative to Tule Wind, the BLM has not addressed Viejas' concerns regarding tribal cultural resource survey and documentation. Viejas has also expressed serious concerns regarding lack of meaningful consultation and unacceptable and unmitigated impacts to the rural cultural landscape/viewshed and sacred golden eagle populations. Moreover, given that we understand the project may require a General Plan amendment from the County of San Diego, SB 18 consultations between the County and Viejas relative to the project would be required; for the federal government to approve this project while those required consultations have neither been initiated nor completed, risks inconsistent project outcomes. Given the lack of seriousness with which the BLM has taken each of our concerns, Viejas is left with no option but to request your denial of this and its related projects.

Regarding Ocotillo Express, the BLM has not addressed Viejas' concerns regarding tribal cultural resource survey and documentation. Viejas has also expressed serious concerns regarding lack of meaningful consultation and unacceptable impacts to the cultural landscape/viewshed and anticipated from increased public access on the project's new, proposed roads. Again, it appears that the BLM is concerned only with those impacts it alone classifies as directly impacting a cultural site - ignoring the myriad indirect, cumulative and landscape-level impacts Viejas - and other tribes - have repeatedly identified to the BLM and the applicant. Moreover, these lands are designated Class L - Limited Use - in the California Desert Conservation Area Plan; meaning, that our Tribe relied on the federal government's

word that these lands would be maintained as open space, to promote and maintain cultural resource values. Given the trajectory the BLM appears headed on this proposed project, it is likely that Viejas will have no choice but to maintain its position that Ocotillo Express must be denied.

Mr. Secretary, the situation in San Diego and Imperial Counties with energy transmission and renewable energy is out of hand. It is poised to forever change the lands of our ancestors and the irreplaceable cultural resources and places that are vital to our tribal life ways, sovereignty and self-reliance. This is our one and only homeland, we have no place else to go. These projects, as proposed, must be denied. We must work together to find more sustainable and environmentally responsible ways to meet energy needs without disregarding the views and needs of the local communities most affected by the impacts of these industrial-scale projects. I am available to directly discuss Viejas' concerns with you.

Sincerely,

VIEJAS BAND OF KUMEYAAY INDIANS

Hon. Anthony R. Pico
Chairman

Attachments:
Letter: Viejas to BLM re Tule Wind (DEIS Comments), dated March 3, 2011
Letter: Viejas to BLM re Tule Wind (Additional Comments), dated March 3, 2011
Letter: Viejas to BLM re Ocotillo Express, dated August 25, 2011

cc:
Steven Chu, Secretary of Energy
Larry Echohawk, Assistant Secretary, Indian Affairs
Jonathan Silver, Director, DOE Loan Guarantee Program
Jim Kenna, Bureau of Land Management
Hon. Barbara Boxer
Hon. Dianne Feinstein
Hon. Bob Filner
Hon. Duncan Hunter
Hon. Dianne Jacob
Larry Myers, Manager, California Native American Heritage Commission
Wayne Donaldson, California SHPO
Eric Gibson, San Diego County DPLU Director
Angelina Havens, Planner, County of Imperial
Hon. Kumeyaay Leaders
Frank Brown, Chair, InterTribal Cultural Resource Protection Council

Comment Letter N9

From: Kimberly Mettler [mailto:KMettler@VIEJAS.com]
Sent: Friday, August 05, 2011 9:48 AM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Express

Good Morning:

In an effort to learn more about the California Desert Conservation Area Plan Amendment, I followed the link referenced in the August 2, 2011 Public Meetings announcement. That link does not work. Furthermore, when following the links on the BLM website to the documents for the Ocotillo Express takes visitors to the Imperial County website. None of those links work.

Can you please provide me with information about how to get a copy of the CDCA Amendment and how to access the DEIR?

N9-01

Thank you!

Kimberly R. Mettler, General Counsel

Viejas Office of Legal Affairs
Viejas Band of Kumeyaay Indians
619-659-1710 (Office)
619-659-2441 (Direct)

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Ewiiaapaayp Tribal Office
Ewiiaapaayp Band of Kumeyaay Indians
4054 Willows Road
Alpine, CA 91901
TEL: (619) 445-6315
FAX: (619) 445-9126
E-mail: wmicklin@leaningrock.net

August 9, 2011

Margaret Goodro, Field Manager
El Centro Field Office
Bureau of Land Management
1661 S. 4th Street
El Centro, CA 92243

Dear Ms. Goodro:

Please accept this letter as the written summary of the Section 106 tribal consultation held between this Tribe and the Bureau of Land Management concerning Pattern Energy's proposed Ocotillo Wind Express Project on July 14, 2011. The Ewiiaapaayp Band of Kumeyaay Indians (the "Tribe") is a federally recognized Indian Tribe and Reservation. The Tribe is a party to consultation with BLM on historic properties to which an Indian tribes may attach religious or cultural significance as required by Section 101(d)(6)(b) of the National Historic Preservation Act (NHPA) and as specified in the implementing regulations for Section 106 of the NHPA at 36 CFR Part 800.2(c)(2)(ii).

N10-01

We thought it was important to communicate to you our perspective and views on this wind energy project, which will provide the benefits of clean, renewable wind energy to the entire region and State of California. Wind is a clean, sustainable source of energy that is mandated by the State of California's Renewable Portfolio Standard (RPS), by the energy needs of California customers, encouraged by the United States federal government through financial incentive, and needed to slow the growing impacts of climate change on the U.S. and world population.

Cultural Resources

N10-02

The record clearly shows that Pattern Energy has been working closely with all the Native American tribes in the area near the Ocotillo Wind Express Project, to ensure that known and eligible tribal historical properties are protected. Monitors from Kumeyaay tribes have all been involved in cultural resource studies to evaluate road and turbine placement. Although some individuals, including tribal persons not representing a tribal government and non-tribal persons, have expressed concerns about the project potentially impacting tribal historic properties, there is no, and cannot be, any dispute that Pattern Energy's development plans will not directly or indirectly significantly or adversely impact any eligible tribal historical properties. To date, the ambitious archaeological survey of an enormous area far exceeding

N10-02 cont

the Project area has identified many cultural resources, but none inside the Project area. Pattern Energy has altered Project plans to avoid sensitive areas to the maximum extent possible and at some significant cost to the Project. This Tribe and others have encouraged Tribal members to work as monitors through the development and construction phases to ensure that any additional cultural resources discovered during project implementation are protected. Pattern Energy has committed to mitigating any additional impacts if discovered in the future at the Project site.

N10-03

The Ewiiaapaayp Tribe Supports the Ocotillo Wind Express Project

California needs a local and responsible source of clean, renewable energy. The economic benefits to California, the clean air benefits to the region and all the humans and animals that call it home, and energy independence are all significant positive impacts that cannot be ignored or discounted.

The Ocotillo Wind Express Project has exceeded all statutory and regulatory requirements in protecting the human environment while preserving the energy output necessary to serve the energy needs of our citizens and maintaining a reasonable financial incentive for Pattern Energy and investors who expect some reward for lending their capital to this Project. Indisputably, wind energy today is the most environmentally-friendly and least costly means of generating electricity. This is one of the few quality wind resource areas in the U.S. that successfully balances energy benefit to environmental impact. Pattern Energy is proven to be a responsible developer and steward of the environment. The Tribe requests that you, as a steward of public lands entrusted with the responsibility to facilitate the responsible, multiple use of public lands that is in the best interests of the public and tribal governments.

On behalf of the Tribe, I can say that we support the Ocotillo Wind Express Project. Should you have any questions, please contact the Tribe's Chief Executive Officer, Mr. Will Micklin, by letter, or by phone at (619) 368-4382 or email at wmicklin@leaningrock.net. Thank you.

Sincerely,

Robert Pinto Sr

Robert Pinto, Sr.
Tribal Chairman
Ewiiaapaayp Band of Kumeyaay Indians

Ewiiaapaayp Tribal Office

Ewiiaapaayp Band of Kumeyaay Indians

4054 Willows Road
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E-mail: wmicklin@leaningrock.net

September 14, 2011

Margaret Goodro, Field Manager
El Centro Field Office
Bureau of Land Management
1661 S. 4th Street
El Centro, CA 92243

Dear Ms. Goodro:

Please refer to the Ewiiaapaayp Band of Kumeyaay Indians' (the Tribe's) letter dated August 9, 2011 that provided its written summary of the Section 106 government-to-government consultation held between the Tribe and the Bureau of Land Management concerning Pattern Energy's proposed Ocotillo Wind Express Project on July 14, 2011. The Tribe desires that it's letters of today's date and August 9th be included in the comments to the Pattern Energy Group Ocotillo Express Wind Energy Project and its draft Land Use Plan Amendment, Environmental Impact Statement and Environmental Impact Report (CACA-051552, LLCAD0700 L51010000, Federal Register Vol. 6, No. 131/Friday, July 8, 2011/Notices, pages 40390-40391). N11-01

The Tribe supports responsible development of the wind energy resource in west Imperial County and east San Diego County, which offers the highest quality wind resource in the United States of America. The need to develop for the benefit of the citizens of our region clean, renewable, low cost wind energy received a very large exclamation point with the power outage of September 8-9, 2011 in all of San Diego County, and portions of surrounding counties and northern Baja Mexico. State, local and tribal governments and their citizens need wind energy as a locally generated source of green, sustainable, local energy. N11-02

That the wide-spread power outage occurred within days of the 10th anniversary of 9/11 should also be hold special meaning for all Americans. Wind energy strengthens our national security by displacing petroleum-based fuels from foreign sources that in many instances use petro dollars to fund our enemies who remain determined to strike our country.

We insist that the Bureau of Land Management make reasonable and prudent decisions regarding the Ocotillo Express Wind Project that encourages the responsible and successful development of this region's wind resource as a means to implement the renewable energy policies of the State of California and the federal government. BLM decisions that value N11-03 bureaucracy above state and national renewable energy priorities is wrong-headed and must be avoided, however ingrained it is in the system. BLM measures of a threat of development to a single plant or animal, instead of the true measure of threats to an entire species as intended by environmental legislation, instead threatens the welfare of every citizen. By our actions today on projects of long duration we determine the welfare of our grandchildren. Should you place the impervious veil of bureaucracy over your eyes and its wadding in your ears, making yourself blind and deaf to attraction of low impact and low cost wind energy projects such as the Ocotillo Express Wind Project or the Tule Wind Energy Project, and impose undue bureaucratic burdens that tax developers with high regulatory costs, then you tax with frightful risk the future of our next generations. **N11-03 cont**

California needs a local and responsible source of clean, renewable energy. The economic benefits to California, the clean air benefits to the region and all the humans and animals that call it home, and energy independence are all significant positive impacts that cannot be ignored or discounted.

N11-04

The Ocotillo Wind Express Project applicant has exceeded all statutory and regulatory requirements in protecting the human environment while preserving the low cost energy output necessary to serve the energy needs of our citizens. The Tribe requests that you, as a steward of public lands entrusted with the responsibility to facilitate the responsible, multiple use of public lands that is in the best interests of the public.

On behalf of the Tribe, I can say that we support the Ocotillo Wind Express Project. Should you have any questions, please contact the Tribe's Chief Executive Officer, Mr. Will Micklin, by letter, or by phone at (619) 368-4382 or email at wmicklin@leaningrock.net. Thank you.

Sincerely,

Robert Pinto Sr

Robert Pinto, Sr.
Tribal Chairman
Ewiiaapaayp Band of Kumeyaay Indians

Comment Letter N12

Ewiiaapaayp Tribal Office

Ewiiaapaayp Band of Kumeyaay Indians

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October 9, 2011

Margaret Goodro, Field Manager
El Centro Field Office
Bureau of Land Management
1661 S. 4th Street
El Centro, CA 92243

Dear Ms. Goodro:

On behalf of the Ewiiaapaayp Band of Kumeyaay Indians (the Tribe), I thank you for your letters dated August 11, 2011, September 14, 2011 and October 5, 2011 concerning the continued government-to-government consultation between the Tribe and the Bureau of Land Management (BLM) concerning Pattern Energy's proposed Ocotillo Wind Express Project.

The Tribe is entirely satisfied with the measures taken by the Ocotillo Wind Express Project applicant with regard to cultural resources and archaeological sites in the Project area. The Tribe is pleased by your report that all archaeological sites are outside of direct impact areas and would not be affected by any project component due to the project reconfiguration to project resources, and that the two cremation sites are outside of the project right-of-way area. The Tribe is confident that Pattern Energy and BLM have and will continue to take any necessary steps to reduce impacts. In our view, Pattern Energy has exceeded all statutory and regulatory requirements through project redesign and realignments in order to protect tribal cultural resources and archaeological sites. **N12-01**

On behalf of the Tribe, I can say that the Ewiiaapaayp Band of Kumeyaay Indians strongly supports the Ocotillo Wind Express Project. Should you have any questions, please contact the Tribe's Chief Executive Officer, Mr. Will Micklin, by letter, or by phone at (619) 368-4382 or email at wmicklin@leaningrock.net. Thank you.

Sincerely,

Robert Pinto Sr

Robert Pinto, Sr.
Tribal Chairman
Ewiiaapaayp Band of Kumeyaay Indians

Manzanita Band of the Kumeyaay Nation

RECEIVED
BUREAU OF LAND MANAGEMENT
2011 OCT -6 PM 12:01
EL CENTRO FIELD OFFICE
EL CENTRO, CA

September 29, 2011

Secretary Ken Salazar
Department of the Interior
1849 C Street, N.W.
Washington DC 20240

National Director Bob Abbey
BLM Washington Office
1849 C Street NW, Rm. 5665
Washington DC 20240

Re: **Tule Wind, Ocotillo Express, San Diego Gas & Electric East County Substation Proposed Renewable Wind Energy Projects and the Proposed Substation**

Dear Secretary Salazar,

As the Chairman of the Manzanita Band of the Kumeyaay Nation, also known as the Manzanita Band of Diegueno Mission Indians, a federally recognized Native American Tribe and Sovereign Nation, I am writing you regarding an issue of grave concern to our indigenous people. It is my purpose to invite you, as the Secretary of the Interior and the National Director of the Bureau of Land Management, to a face-to-face consultation.

As senior leaders of the United States government and its federal land holdings, it is vitally important for us as a government to address our concerns with you in the tradition of our ancestors, face to face. Only then can the essence of our native people be heard at a level necessary to avoid another catastrophic failure in your trust responsibilities to the Native American people of Southern California.

Time is of the essence since you have designated the **Tule Wind, Ocotillo Express, and San Diego Gas & Electric (SDG&E) East County Substation (ECO)** renewable energy projects as *"priorities"* for your government and are in the process of *"fast tracking"* the approval process.

N13-01

PO Box 1302 Boulevard California 91905 Phone (619) 766-4930 Fax (619) 766-4957

N13-01 cont

We have meet with your local field management team to express our concerns but it is clear the approval of both these priority projects will be made at the national level. Thus, fundamental fairness requires a meeting of equals to discuss the situation and to explore mutually beneficial options. As a prelude to our meeting, I would like to provide you with some background information for context.

N13-02

Renewable Energy

We as a sovereign government generally favor renewable energy as a means to provide the necessary clean energy for our surrounding metropolitan communities and here on our reservation lands. Our Manzanita government is not against renewable energy as a concept and we are not against any specific renewable energy project per se. In fact, Manzanita is currently contemplation a wind project to be located here on our trust land. We are actively in the process of performing complete due diligence studies to insure the integrity of a proposed wind project on our reservation.

However, the Manzanita government does stand firmly against any project, renewable energy or otherwise, that endangers our few remaining ancestral habitation sites or unreasonably endangers our sacred Golden Eagles. Your DOI/BLM departments are rushing toward approval for the Tule Wind, Ocotillo Express, and ECO Substation projects without proper safe guards to protect the Native American cultural landscape, view shed, sacred sites, or protect our endangered Golden Eagle population that is already in rapid decline.

As such we are formally filing our governmental objection to your approval of Tule Wind, Ocotillo Express, and the San Diego Gas & Electric's East County Substation Projects.

N13-03

Golden Eagles

Recent and historical studies have shown a steady and rapid decline in the population of Golden Eagles residing in east San Diego and west Imperial Counties. The generally accepted reason for this alarming decline is the intrusion on human contact in the core nesting areas.

Tule Wind is proposing to install and operate wind turbines well within the eagle buffer zone suggested by your U.S. Fish and Wildlife Service. Golden Eagles are historically known to forage on the slope where Ocotillo Express plans to install numerous wind turbines. Service roads for both projects will provide public access to these environmentally sensitive areas. Eagle studies are not yet completed to satisfactorily determine the risk according to the revised USFWS guidelines for eagle protection. Yet these projects are fast tracked for environmental approval and Environmental Impact Studies (EIS) are scheduled for publication. This is fundamentally wrong and a breach in proper procedures that are designed to avoid this very outcome.

The Golden Eagles are sacred to not only the Kumeyaay people but to your very United States government and citizens as well. How can you, as the senior leadership and current stewards of the land, allow this to progress on a priority fast track process toward approval while clearly endangering the very symbol of our freedom?

Additionally, the California condors are attempting to repatriate the region as a midway stopping and perhaps even nest again here to link existing condor nesting sites in Northern Baja California and the costal Mountains of Central and Southern California. To our knowledge no studies on the impact of these projects on the California condors attempts to repopulate our region is required under the existing NEPA documents. No proper Avian Protection Plan is in place to protect our eagles and condors but the process for both project approvals march forward regardless. N13-03 cont

Native American Culture

As you may well know, the history of the European conquest, State of California, and the United States government is a long series of atrocities regarding treatment of the Native Americans. Although one would hope that in our present day this behavior and governmental actions would no longer be tolerated. However, through your fast track process toward approval the construction of these two wind projects, Tule Wind and Ocotillo Express, as well as fast track priority approval of the ECO Substation is in fact another example in the long line of U.S. governmental actions resulting in cultural and spiritual genocide. We implore you to repeal the priority status of these three projects applications and provide sufficient time for reasonable consideration and balance all concerns before it is too late.

We respectfully request you to consider that the Kumeyaay people do not record or maintain our history in books and libraries as the white man culture does. We Native Americans record our history on the land where we lived, at the sacred sites where we prayed, and in the communities where we coexisted in harmony with the cultural and environmental landscape. Our people have maintained this way for ten thousand years and it is only in the past two hundred years that we were forced to abandon our way of life as a means of survival. The Creator selected us, as native people, to be the original stewards of the land and to live through our connection with our ancestors through our cultural history and spiritual connection to the land. N13-04

We Kumeyaay once lived in most all of what is now considered San Diego and Imperial Counties (Southern California). It was our heritage tradition to migrate with the seasons. Kumeyaay tribes lived and traveled along the local coastal beaches, throughout the inland valleys, coastal mountains, desert floor, and Gulf of California. Our history was once written on the land in San Diego Harbor, Coronado, La Jolla, Mission Valley, El Cajon, and Escondido.

The vast majority of our heritage history evidencing that our people lived here in the region for over 10 millenniums is now gone due to the development of these prime real estate locations. All that remains of our history lies in the few remote areas of McCain Valley, Jacumba, and Ocotillo. San Diego Gas and Electric projects already approved by the BLM and DOI are in the process of elimination our cultural landscape along the desert slope of Ocotillo and parts of Jacumba and McCain Valley.

Approval of the proposed three projects will erase our cultural history from McCain Valley, Ocotillo, and Jacumba. Construction of these projects will eradicate the last remaining untouched ancestral homelands of the Kumeyaay. If it is the goal of the U.S. Government to eliminate the Native American history in our region then your fast track approval for Tule Wind, Ocotillo Express, and the ECO Substation is the very best way to accomplish this objective.

It is on this land in McCain Valley, Jacumba, and Ocotillo where our ancestral people lived, worked, worshiped, sang, danced, and died. It is on this land that our people were cremated ceremoniously and our family bones are placed undisturbed on the land, hopefully for all time. Now, approval of your three priority projects will destroy in one generation what took hundreds, even thousands of generations to establish. All for technology that could well be antiquated within just one twenty-year generation. Let us not rush ahead be so foolish. **N13-04 cont**

McCain Valley, Ocotillo, and Jacumba, are all three **Traditional Cultural Properties** and the last of our Kumeyaay major heritage sites. We request that **Cultural Conservation Easements** be establish so that the general public has restricted access and these sacred communities can be again preserved for our Native citizens to ceremonially enjoy without energy project structures.

__Sacred Sites__

Your archaeologist survey the areas in and around these proposed energy projects then define the sites by boundaries according to their finite knowledge of our people and our traditions. The McCain Valley, Jacumba, and Ocotillo Heritage Districts cannot be adequately defined or protected by lines drawn on a map by the developer's archaeologist. Our cultural landscape and traditional communities cannot be limited to the private developer's boundary sites. McCain Valley, Jacumba, and Ocotillo are all we have left.

These three areas are vitally connected as communities by the practical and fundamental use of our people over centuries. Yes, one site might be for tool making, another for harvest and roasting, while others were villages, and still others remain cremation and burial grounds. The entire areas of McCain Valley, Jacumba, and Ocotillo are each connected cultural districts and not limited to individual use sites as your science chooses to define. **N13-05**

Placing wind turbines and transmission lines between your described and limited archaeological sites desecrates the ancestral communities that were established and in practice long before your written history. Using your science to define and describe our historic cultural communities and spiritual concepts is another example of how your government dishonors ours. These Native American homelands are Traditional Cultural Properties that are cherished and should be protected.

As further evidence of this blatant disregard for our Native American culture and spiritual practices, is apparent in that nowhere in your archaeological reports does it mention the sites sacred to our Kumeyaay people.

As a specific example, in McCain Valley there is a single monolithic rock that towers over the region and rest along the ridgeline of the Pacific Crest coastal mountain range. We have a Kumeyaay name for this place but you know it as "Lost Valley Rock." This towering rock can be seen from great distances and served as an anchor point as well as a compass for our people to navigate each season up from the desert floor. Guided by this sacred site our people found their way from their desert homes in Ocotillo into the summer mountain villages in McCain and **N13-06**

Jacumba Valleys. These three areas served as our traditional homelands before Indians were pinned up on reservations.

Our spiritual leaders regularly held religious services of prayer and thanksgiving at Lost Valley Rock where we asked the Creator for safe passage, food, water, shelter, and protection for the Kumeyaay people. It is at this rock where the Kumeyaay people gathered in McCain Valley to worship our Creator. This sacred monument reaches skyward to Heaven and serves as our physical symbol much like a cathedral to honor God. Now Tule Wind proposes to place wind turbines and transmission lines in McCain Valley along side of Lost Valley Rock. No tower set backs here in McCain Valley will serve to preserve the cultural landscape of this sacred site.

When the Manzanita Band was placed on the existing reservation we were not allowed to live in McCain Valley or Jacumba and seasonally migrate to Ocotillo. The view shed from our existing reservation land looks out over and across McCain Valley so that at least we can honor and worship this sacred rock as our ancestors have for thousands of years. If you approve the Tule Wind project even that will be taken away from us for instead of looking at Lost Valley Rock we will be looking out from our reservation homes at dozens of large wind turbines and transmission power lines.

N13-06 cont

Cemetery Sites

Sacred to our people, just as cemetery sites are to yours, are our cremation locations that serve as honored burial grounds. McCain Valley has several documented cremation sites. Ocotillo has at least five known cremation cemeteries and another major cremation site in Jacumba that will be impacted by the proposed projects. Now, according to your archaeological reports, these cremation sites are not "directly" impacted since they are outside the limited boundaries drawn as your developer's archaeological sites.

I appeal to your common sense and reason here as a human being. Would you consider it a negative impact to have wind turbines and power transmission lines running along side or along the streets inside of Arlington National Cemetery or the Old Granary Burying Grounds in Boston where many the United States' founding fathers are laid to rest?

Why is the resting place for our Kumeyaay founding fathers any less important or why should our National Cemeteries be given any fewer honors?

N13-07

In Summary

The Manzanita government in general favors renewable energy. Our own project does not impact any archaeological, cultural, or sacred sites. It should be pointed out that when our people had free access to the land Kumeyaay people did not reside on the desolate parcels we are pinned up on now but rather lived in the valleys and slopes such as McCain, Jacumba, and Ocotillo where food, water, and shelter were available. This is why the areas of McCain Valley, Jacumba, and Ocotillo are so rich with our history and culture.

N13-08

Here at Manzanita we are taking ever precaution to ensure our turbines do not endanger Golden Eagles or the California condor. If it turns out after extensive study that they do, we would not proceed with construction of any wind turbines or transmission lines. We respectfully ask that you do the same due diligence in your studies and remove the priority / fast track processing status unfairly provided to the private developers and foreign companies that are lobbying for approval.

N13-08 cont

As a Sovereign Nation recognized by your United States government and as part of your trust responsibility to Native Americans, we urgently ask that you travel here for a face-to-face consultation with the Native American Tribes directly impacted by your decision prior to reaching any conclusions. Absent a meaningful government to government consultation with our peers, the Manzanita Band of the Kumeyaay Nations stands against the U.S. Government approval of Tule Wind, Ocotillo Express, and the SDG&E ECO Substation projects.

I look forward to you response and acceptance of our invitation to talk over solutions, face-to-face.

Respectfully,

Leroy J. Elliott, Tribal Chairman
Manzanita Band of the Kumeyaay Nation

cc:

Anthony Pico, Tribal Chairman
Viejas Band of Kumeyaay Nation
1 Viejas Grade Road
Alpine, CA 91901

Steve Black, Counselor to the Secretary
Department of the Interior
1849 C Street, NW
Washington, DC 20240

State Director Jim Kenna
BLM California State Office
2800 Cottage Way, Suite W-1623
Sacramento, CA 95825

District Manager Teri Raml
BLM California Desert District Office
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Field Manager Margaret Goodro
BLM El Centro Field Office
1661 S. 4th Street
El Centro CA 92243

Associate Field Manager Tom Zale
BLM El Centro Field Office
1661 S. 4th Street
El Centro CA 92243

Congressman Duncan Hunter
Washington DC Office
1429 Longworth HOB
Washington D.C. 20515

Comment Letter N14

CARMEN LUCAS
KWAAYMII LAGUNA BAND OF INDIANS
Native American Consultant/Educator/Monitor
P.O. Box 775 Pine Valley, California 91962
619-709-4207

30 SEPTEMBER 2011

RECEIVED
BUREAU OF LAND MANAGEMENT
2011 OCT -3 PM 1:55
EL CENTRO FIELD OFFICE
EL CENTRO, CA.

BUREAU OF LAND MANAGEMENT
ATTN: MR JAMES KENNA, STATE DIRECTOR
CALIFORNIA STATE OFFICE
2800 COTTAGE WAY, SUITE W-1623
SACRAMENTO, CALIF 95825-1886

REF: OCOTILLO EXPRESS WIND ENERGY PROJECT

N14-01

I AM A KWAAYMII INDIAN OF LAGUNA MOUNTAIN CALIF AND AM WRITING TO YOU MR, KENNA, TO REQUEST YOUR IMMEDIATE REVIEW OF THE OCOTILLO WIND ENERGY FACILITY DRAFT REPORT (ENVIRONMENTAL IMPACT). AS YOU KNOW THE PUBLIC COMMENT PERIOD CLOSES OCT 5, 2011. THIS KWAAYMII INDIAN AND OTHER INDIAN TRIBES AND MEMBERS OF THE PUBLIC HAVE SERIOUS CONCERNS ABOUT THE APPARENT PLAN ABOUT THE DIRECT INDIRECT AND CUMULATIVE IMPACTS OF THIS PROJECT, AND ABOUT THE APPARENT PLAN TO APPROVE THE PROJECT DESPITE THE NUMEROUS OBJECTIONS AND CONCERNS—

N14-02

I AM ALSO CONCERNED WITH THE BLM'S FAILURE TO ENGAGE IN MEANINGFUL CONSULTATION WITH INDIAN TRIBES ON THIS AND OTHER SUCH PROJECTS

IT IS REQUESTED THAT:

(1) BLM HOLD PUBLIC HEARINGS WHICH ALLOW FOR PUBLIC TESTIMONY ON THE RECORD
(2) BLM EXTEND THE DEIR PUBLIC COMMENT PERIOD TO 5 NOV 2011 OR LATER TO ALLOW FOR PROPER REVIEW AND COMMENT—

THANK YOU FOR YOUR TIME IN THIS MATTER - SHOULD YOU HAVE ANY QUESTIONS PLEASE FEEL FREE TO CALL ME AT THE NUMBER LISTED ABOVE

CC: BLM El Centro

Sincerely

CARMEN LUCAS
KWAAYMII LAGUNA BAND OF INDIANS
Native American Consultant/Educator/Monitor
P O Box 775 Pine Valley, California 91962
619-709-4207

4 November 2011

Margaret L Goodro; Field Manager
United States Department of the Interior
Bureau of Land Management El Centro Field Office
1661 S 4th Street
El Centro, California 92243

RECEIVED
BUREAU OF LAND MANAGEMENT
2011 OCT -5 AM 11:46
EL CENTRO FIELD OFFICE
EL CENTRO, CA.

Reference: Draft Plan Amendment and Draft Environmental Impact Statement/Environmental Impact Report for the Ocotillo Wind Energy Facility Executive Summary

Subject: Request for Denial of Proposed Ocotillo Express Wind Project

Dear Ms Goodro:

N15-01

Pleased be advised that the undersigned has been trying to review the reference in-between, my work schedule and the requirements of daily life. I have found that between all the other projects that your office continues to request my review and comments on, are more than over whelming and impossible to do justice to. The question has to be asked if that is by design. Like other Indian Tribes, I have serious concerns about the plans of Direct/ Indirect and Cumulative impacts that this project will have on the overall Ocotillo Desert Area

Reviewing the images presented in the reference of the Visual Simulations for the Proposed Project Area represents an attitude by an out of state developer who flagrantly and unashamed; plans to create an offensive obtrusion to the view shed and essence of place for the entire Ocotillo Area. The Desert of Southern California is part of our ancestral Traditional Cultural Landscape; a place that is the embodiment of and continues to hold our Indian History as the old ones wrote it in and on the earth.

N15-02

It has been an ancient; well know fact among those who exercise leadership with integrity that honest decisions can not be made in good faith with out complete and honest information. I am concerned that BLM or any other approving agency for that matter would approve the Ocotillo Wind Project with out the complete and through Cultural Resources Report. I find it troubling to read in Chapter 4, of the reference; comments such as "Detail forthcoming"/"Detailed Recording in Progress; referring to the Cultural Resources as recorded in the document. It is also troubling to know that the comments/interpretations in that document are most generally those of the Archaeologist; not the Indians whose history it is. As you know The Ocotillo Wind Energy Project encompasses many miles; with in those many miles are hundreds of cultural deposits of our

N15-02 cont

ancestors to included cremated human remains that are sprinkled across that landscape. The archaeological process has identified some of that history; however to draw circles around each cultural deposit that the archaeologists have located and refer to that as a site, is to chop up the whole with disrespect and disregard for the whole of that prehistory cultural, its use and the knowledge that the old ones had in knowing how to use that landscape with out destroying it for over 10,000 years.

N15-03

The applicant boosted in the resent two public presentations that he is proud that his project has been adjusted to where they will avoid all of the cultural deposits and place turbines out side the cultural sites. I have had an opportunity to view just one of those readjusted turbine locations. That turbine will be placed in a wash, (which is subject to flash floods in the future) the turbine will be placed just a few feet from two sites that will no doubt be impacted over a period of time by both the development of the turbine and the turbines need for an access road to each turbine for the next thirty years to conduct maintenance.

N15-04

Under the 106 Tribal Consultation Meetings, we have had an opportunity to visit a few sites; those site visits had been selected by the people in charge of the 106 Consultation. At the most resent site visit, it was suggested by the archaeologist for Terra Environmental; conducting the tour that we would only be allowed 30 minutes at each site. We Indians are passionate in regards to our ancestral heritage; we need as much time as we need to pay homage to our old ones.

N15-05

It has been requested a number of times by both my self and my attorney that site visits to the actual turbine locations be provided; that request has been non responsive. Although I have not had an opportunity to review the completed Cultural Report, I am requesting site visits to the following sites:

CA-IMP - 2471
3689
6509/6510
6920
6921
OCO-AMC - 004
028
042
045
049-H
082
083

OCO-AMC -501
OCO-BF- 012
OCO-EAM- 002
058
076
OCO-KRM- 023
OCO-LPM- 009
OCO-RSC- 001
OCO-SAC- 032H
OCO-VAP- 028

I would like to take this opportunity to also reserve the right to request additional site visits once I have been given an opportunity to review the completed Archaeological Cultural Report.

Thank you for the opportunity to comment on this important issue, should you have any questions please feel free to call me.

Sincerely,

CARMEN LUCAS
Kwaaymii, Laguna Band of Indians

Copy to:
Native American Heritage Commission
Courtney Ann Coyle, Attorney

Comment Letter N16

SAN PASQUAL BAND OF DIEGUEÑO MISSION INDIANS OF CALIFORNIA
SAN PASQUAL RESERVATION

October 1, 2011

Bureau of Land Management (BLM)

Attn: Mr. James Kenna, State Director

California State Office

2800 Cottage Way, Suite W-1623

Sacramento, CA 95825-1886

RE: Ocotillo Express Wind Energy Application;

Dear Mr. Kenna,

This letter is in response for your request for Tribal Cultural Resources information and consultation in reference to the section 106 processing, as it relates to the Ocotillo Wind Express Renewable energy development, NEPA and CEQA compliance; with respect to the San Pasqual Band of Indians.

On behalf of the San Pasqual Band of Indians (The Band), I am providing comments to bring to your attention the wide-ranging negative impacts to BLM land and resources proposed by the applicant within the project scope. I have reviewed the Ocotillo Wind Energy Facility Draft Environmental Impact Report, been involved with public consultation/ informational meetings, and have attended project site visits. After consideration of the entire project, we must go on record in opposition of Ocotillo Express project, and in opposition of a BLM lease for these public lands.

N16-01

Regarding regulatory procedures as provided for in NAGPRA and CEQA: The activities proposed in the Area of Impact will have irreversible direct and indirect consequences to all the resources in and adjacent to this project, that are not been thoroughly evaluated as required by law. The Band is very concerned that comprehensive environmental and cumulative impacts are not thoroughly evaluated in the DEIR. The Band is also concerned that Tribal Consultation has not been in compliance with standard good faith efforts; these factors can be confirmed in the project DEIR, and BLM record of consultation. For these concerns

N16-02

Additionally, The Band opposes approval of the project on grounds that the Wind Data is insufficient to determine project feasibility. Wind energy studies reveal that in order to provide a true representation of air-shed characteristics, surveys need to be conducted over a number of years. The applicant should be required to provide proof of accurate data regarding windfall and wind drought cycles, necessary for any wind energy project of this magnitude to be successful. Insufficient data determining wind generation feasibility, is another major reason that the BLM should deny the project.

N16-03

IPAI

SAN PASQUAL BAND OF DIEGUEÑO MISSION INDIANS OF CALIFORNIA

SAN PASQUAL RESERVATION

Regarding impacts to Cultural Resources, The Band is very concerned with impacts on Archeological resources and the related destruction to the Indigenous Cultural landscape. The proposed impacts to our Cultural landscape can be equated to severe damage to our Traditional Kumeyaay/Hokan religious freedom. If this project is approved by the BLM, Sacred Site privacy and sanctity will certainly be destroyed. This is due to additional roads, construction disturbances, and increased continuous human impact. On the grounds that this project has a negative impact on our Indigenous religious freedoms, we oppose disturbance of traditional Cremation Grounds, and all Cultural Resources in and adjacent to the proposed project. **N16-04**

Regarding impacts to Biological resources, the Band is concerned and opposed to disturbance of several Endangered Species in the area; for instance, known Eagle populations will be directly impacted by the proposed wind turbine activity. Indigenous communities are dependent on floral and faunal resources for traditional gathering areas for medicinal and utilitarian plants species. From this perspective we believe this project will have a negative impact on our cultural economy in the modern context; as it will negatively impact the availability of culturally important plants and animals as well as long term impacts to the genetic quality of remaining ethno-botanical resources. Upon reviewing the DEIR it is apparent that the project lacks an evaluation of cumulative impact to Biological resources; this includes: plant life, animal life, birds, reptiles, amphibians, insects, soils, rock outcroppings, springs, aquifers, air quality, water quality, noise pollution, light pollution, and ecosystem symbiotic relationships; All these mentioned resources are essential to our modern culture and life ways. Wildlife resources and area Ecology should be considered from an indigenous world view as well as provided full protections as regulated under Endangered Species Act and other natural resource protection laws. If this project is allowed by the BLM, we know that the ecology of the entire area will be disturbed and maybe destroyed forever. For example, the project proposes to dramatically increase the number of dirt roads in the area; dirt road impacts include: degradation of local air quality and the increased traffic will cause wildlife fatalities, interrupt breeding behaviors, and inhibit plant pollination/oxygen exchange functions. The increase in dirt roads also leads to destruction of fragile soil resources; such as, cryptosporidium and terrestrial seed banks that take hundreds,(if not thousands) of years to develop. When considering these projects please remember that this delicate ecology is essential to all life in the desert. **N16-05**

In closing, the San Pasqual Band of Indians asks that the BLM closely review the DEIR data and records for compliance and feasibility. The project proposes impacts to our archeological heritage and contemporary culture that are unacceptable. The San Pasqual Band of Indians asks you consider our comments, the concerns of other affected Tribes, and the voice of numerous environmental organizations; as we oppose the Ocotillo Express application and land lease. **N16-06**

Respectfully,

David Toler,
Business Committee
Tribal Government Delegate
San Pasqual Band of Indians

C.c.
Margret Goodro, BLM El Centro Field Office 1661 S. 4th St. El Centro Ca, 92243
Thomas Zale, BLM El Centro Field Office 1661 S. 4th St. El Centro Ca, 92243

P.O. BOX 365 • 27458 N. LAKE WOHLFORD RD., VALLEY CENTER, CA 92082
PHONE 760-749-3200 • FAX 760-749-3876 • WWW.SANPASQUALINDIANS.ORG

CENTER *for* BIOLOGICAL DIVERSITY *Because life is good.*

protecting and restoring natural ecosystems and imperiled species through science, education, policy, and environmental law

VIA ELECTRONIC MAIL AND U.S. MAIL (with references on CD-rom)

September 16, 2011

U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT
Regulatory Division, Carlsbad Field Office
ATTN: SPL-2009-00971-MBS
6010 Hidden Valley Road, Suite 105
Carlsbad, California 92011
Meris.Bantilan-Smith@usace.army.mil

Re: Public Notice/Application Number: SPL-2009-00971- MBS

Dear Army Corps of Engineering:

These comments are submitted on behalf of the Center for Biological Diversity and Natural Resources Defense Council (collectively "conservation groups") regarding the Public Notice/Application No.: SPL-2009-00971- MBS ("Notice").

Introduction

The development of renewable energy is a critical component of efforts to reduce greenhouse gas emissions, avoid the worst consequences of global warming, and to assist California in meeting emission reductions. The conservation groups strongly support the development of renewable energy production, and the generation of electricity from wind power. However, like all projects, proposed wind power projects should be thoughtfully planned to minimize impacts to the environment. In particular, renewable energy projects should avoid impacts to sensitive species and habitat, and should be sited in proximity to the areas of electricity end-use in order to reduce the need for extensive new transmission corridors and the efficiency loss associated with extended energy transmission. Only by maintaining the highest environmental standards with regard to local impacts, and effects on species and habitat, can renewable energy production be truly sustainable.

O1-01 Unfortunately, the Notice for the 404 permitting and the DEIS for the proposed plan amendment and right-of-way application on which the Corps relies fail to provide adequate identification and analysis of the significant impacts to water resources, water quality, ephemeral streams and washes, Peninsular bighorn sheep, flat-tailed horned lizard, birds, bats, rare plants, other biological resources, cumulative and growth inducing impacts of the project, and lacks consideration of a reasonable range of alternatives. **O1-02** In addition, the agencies have failed to fully examine in impact of the proposed plan amendment (and other similar proposed plan amendments) that would result in industrial sites sprawling across the California Desert within

Arizona • California • Nevada • New Mexico • Alaska • Oregon • Washington • Minnesota • Vermont • Washington, DC

Lisa T. Belenky •Senior Attorney • 351 California St., Suite 600 •San Francisco, CA 94104
tel: (415) 436.9682 ext. 307 *fax:* (415) 436.9683 lbelenky@biologicaldiversity.org *www.BiologicalDiversity.org*

habitat that should be protected to achieve the goals of the federal bioregional plans as a whole and specifically habitat that is essential to the recovery of the endangered Peninsular bighorn sheep. **O1-02, cont.**

The Project is Not Water Dependent and Therefore Should Avoid Impacts to All Desert Washes, Ephemeral Streams, and Riparian Areas

As the Corps' Notice correctly states (Notice at 4), the proposed project is not water dependent. Therefore, all desert washes, ephemeral streams and riparian areas should be avoided. As the Corps is well aware desert riparian areas are fragile and disturbance of the soils in these areas can significantly increase erosion and sedimentation. Although water is scarce and flooding infrequent in desert regions, ephemeral and intermittent streams are a significant ecosystem component and washes are critical to the survival of many native plants and animals. *See, e.g.*, Levick, et al. (2008). "Ephemeral and intermittent streams make up approximately 59% of all streams in the United States (excluding Alaska), and over 81% in the arid and semiarid Southwest (Arizona, New Mexico, Nevada, Utah, Colorado and California)." *Id.* at iii. Ephemeral and intermittent streams provide the same ecological and hydrological functions as perennial streams by moving water, nutrients, and sediment throughout the watershed. When functioning properly, these streams provide landscape hydrologic connections; stream energy dissipation during high-water flows to reduce erosion and improve water quality; surface and subsurface water storage and exchange; ground-water recharge and discharge; sediment transport, storage, and deposition to aid in floodplain maintenance and development; nutrient storage and cycling; wildlife habitat and migration corridors; support for vegetation communities to help stabilize stream banks and provide wildlife services; and water supply and water-quality filtering. They provide a wide array of ecological functions including forage, cover, nesting, and movement corridors for wildlife. Because of the relatively higher moisture content in arid and semiarid region streams, vegetation and wildlife abundance and diversity in and near them is proportionally higher than in the surrounding uplands. *Id.* **O1-03**

The use of washes for any of the proposed project facilities, including access roads and transmission should be prohibited as well as destruction of vegetation. Specifically, creation of a network of new roads in the washes to access turbines and infrastructure outside of the washes should be avoided because such roads would destroy vegetation and habitat, increase siltation, and destroy soil integrity. **O1-04**

Alternatives Analysis is Inadequate

The alternatives analysis is inadequate even with the inclusion two smaller 315 MW projects. At least one alternative should be considered that avoids of all primary streams. **O1-05** Moreover, other alternatives should be considered which would avoid both "primary" and "secondary" streams including, for example, alternative siting on previously degraded lands. In addition, the Notice and the DEIS/R should have considered distributed renewable energy alternatives, a no-build alternative that would focus on programs to efficiency and conservation efforts which could more than make up in energy savings the power that would be produced by **O1-06**

O1-06, cont.

this project, and other alternatives that could avoid impacts of the proposed project as well as impacts of the associated transmission lines and substations.

O1-07

The Corps in the Notice and the BLM/County in the DEIS/R failed to adequately address such any off-site alternative that would significantly reduce the impacts to water resources and water quality, as well as biological resources including the flat-tailed horned lizard and its occupied habitat, and other special status species including raptors and Peninsular bighorn sheep. The Center urges the Corps not to rely on the BLM/County's flawed DEIS/R and to work with the BLM to revise the DEIS/R to adequately address these and other issues detailed below and then to re-circulate both a revised Notice and a supplemental DEIS/R for public comment.

Avian Species and Risk Assessment

O1-08

While the DEIS/R attempts to provide a risk assessment to avian species (primarily birds) and collision with wind turbines, recent science shows that "No relationship between variables predicting risk from E[nvironmental] I[mpact] A[ssessments]s and actual recorded mortality was found" and more importantly that "EIAs are usually conducted at the scale of the entire wind farm. The correlation between predicted mortality and actual mortality must be improved in future risk assessment studies by changing the scale of these studies to focus on the locations of proposed individual wind turbine sites and working on a species specific level".[1] Unfortunately the DEIS/R risk assessment is at the scale of the entire wind project and fails to evaluate specific turbine locations and their impact on avian species. Therefore, additional analysis must be provided, based on the number of avian species with potential for impact. This would then provide information that could also help inform additional siting alternatives that could also be designed to minimize impacts to the waters of the U.S. and the waters of the state.

Migratory Birds

O1-09

The document briefly discusses migratory birds and migratory pathways in southern California. However, nocturnal bird migration was not studied or addressed in the DEIS/R at all. Recent published scientific reports indicate that greater than 10% of nocturnal migrating songbirds migrating over ridges fly at elevations putting them within the area of rotating turbines.[2] An on-site nocturnal radar study in California's desert at San Gorgonio Pass prior to the wind energy development reported that "approximately 37 million birds passed through the Coachella Valley in the fall and an additional "approximately 32 million birds flew through the Coachella Valley during spring 1982," making the total in 1982 approximately 70 million birds. The study concludes "we estimate that approximately 256,000 birds/km could potentially come into contact with wind turbine generators each fall in the WRSA" and "approximately 182,000 birds/km potentially come into contact with wind turbine generators each spring."[3] The document needs to analyze the on site impacts of the larger turbines proposed at Ocotillo Express Wind project on nocturnal migratory songbirds and bats in comparison to this data on a nearby site.

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[1] Ferrer et al. 2011

[2] Mabee at al. 2006

[3] McCrary, et al 1982

Furthermore, the DEIS/R fails to acknowledge that the Ocotillo wind project is located on the Pacific Flyway and provides no data for the impacts of the project on nocturnal migratory birds and bats or on migratory pathways for birds and bats. Migratory birds are protected by the Migratory Bird Treaty Act of 1918 and the project must address these impacts. O1-10

Recent research has established that species such as Golden Eagles tend to hunt or migrate at or below ridgelines, potentially putting these species at risk if turbines are deployed in these ridge areas (Manville 2009). The proposed "mitigation" measure is to have a biologist full time during daylight hours for the first 3 years of operation, with the "primary purpose of" having the biologist detect golden eagles from the observation tower "prior to eagles flying in to the site using the Applicant's Merlin Avian Radar System and high-resolution video camera system technology, combined with the use of spotting scopes and binoculars. If eagles are detected, the biologist would have the ability to shut down the WTGs in portions of the site to help minimize and avoid collisions with WTGs. The WTG blades would come to a complete stop within 60 seconds of WTGs being shut down. The biologist would be responsible for determining when the eagle has left the project site so that operation of the WTGs could resume." DEIS/R at 4.21-15. This proposal even if it might prove effective for eagles (which is not certain) does nothing for other raptors and birds protected under the MBTA or nocturnal migration. Furthermore, the "mitigation" measure, if effective, simply delays impacts to golden eagles for 3 years after which time no one will be watching or turning off the turbines and collisions with turbines by golden eagles will occur. O1-11

Raptors

Raptors are highly vulnerable to collision with wind turbines. The EIS/R and Appendices are unclear regarding the methodology used for the raptor migration study, and exactly how many hours of surveys were actually done. Industry standards for large bird surveys defined by Hawk Migration Association of North America, Hawk Watch International, Cape May Bird Observatory and others recommend all day surveys every day to determine raptor use on the site. Only by using this method can relatively rare events such as occasional large migration flocks of Swainson's Hawks, which are known to congregate nearby, Turkey vultures or White Pelicans be detected. A less rigorous survey approach would easily miss the presence of Golden Eagles during migration or from nearby nests that were documented, two of which are reported as active. O1-12

Raptor species on the proposed project site are protected under the federal Migratory Bird Treaty Act, including those species known to be vulnerable to turbine collision such as the red-tailed hawk. Many important questions remain unanswered including, for example, the following:

- Aside from the aerial survey completed by the Wildlife Research Institute (WRI), were focused ground-based raptor nest surveys completed within the Ocotillo Wind project site in order to accurately characterize the resident population density of particularly vulnerable raptor species? O1-13

- o How close are red-tailed hawk nests and other raptor species nests located to proposed wind turbines? O1-14
- o Combined with nest survey results, is red-tailed hawk use (data from point count surveys) of the Ocotillo Express Wind project considered reflective of a low or high density of this species as compared to other parts of the County? O1-15
- o Is the proposed Ocotillo Express Wind project likely to result in impacts to the local population of red-tailed hawks from turbine collision and if so, how will these impacts be minimized? O1-16

Golden Eagle

The DEIS/R fails to adequately address the issue of golden eagle collisions with turbines. Nor does it address the Bald and Golden Eagle Protection Act, which imposes strict limitations on take of eagles. The Final Rule on Eagle Act Take Permits (74 FR 48635) establishes a "no net loss" standard for eagles, and it is unknown whether proposed mitigation efforts as reflected in an avian protection plan will pass muster with the U.S. Fish & Wildlife Service (USFWS). O1-17

The DEIS/R cites a study in footnotes entitled WRI (Wildlife Research Institute). 2011. However, the cited report is not provided as an Appendix. Instead, the DEIS/R has provided a brief statement of some data from the report. The study that is cited in the DEIS/R must be provided for public review, rather than the abbreviated and interpreted results O1-18

Additionally, the DEIS/R fails to make any determination on the significance of impacts to golden eagles from the operation and maintenance. O1-19

The DEIS/R also concludes that "As with construction, O&M would not result in direct or indirect impacts to golden eagle nest sites because the nearest nest site is a minimum of 2 miles from the proposed OWEF site" (DEIS/R at 4.21-12). However, the National Golden Eagle Colloquium on March 2-3, 2010 attended by 85 participants from various agencies and Golden Eagle and raptor scientists from across the country contradicts this analysis. The scientists concluded that "[b]uffers we currently recommend are at least 4 - 10 air miles from a golden eagle territory."[4]

The DEIS/R also states that "WRI's spring 2010 helicopter surveys within the 5 known golden eagle territories indicated that there are 20 nest sites within 10 miles of the proposed OWEF site." DEIS/R at 3.23-4. All of these nests in the 5 territories are within the avoidance buffer zone from the Colloquium. Additionally, the document does not indicate how close the eagle nests are to the projects site. Eagles often fly much further than a five mile territory. A nest as close as 0.5 miles would predictably kill adult and fledgling eagles, and five territories of golden eagle indicate an unacceptable risk of "take" for golden eagle in mortality and disturbance for a wind project. O1-20

We recommend that the DEIS/R be revised and re-circulated in order to reconsider impacts to Golden Eagle more thoroughly using recommendations and analysis by eagle experts who performed the surveys as well as peer review by qualified eagle experts. The next iteration of the DEIS/R. Such reconsideration would allow the agencies including the Corps to fully evaluate the site and whether it should be abandoned due to unacceptable, unmitigable risk to Golden Eagle. O1-20, cont.

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[4] National Golden Eagle Colloquium 2010

California Condor

The DEIS/R's discussion of the California condor does not address San Diego Zoo's Institute for Conservation Research/San Diego Zoo Global's current and future reintroduction plan to increase the population size of this species inhabiting the region south of the proposed project in Baja California. Consideration of potential impacts to California condors from risk of collision with turbines appears inadequate to address expanding range of this species in vicinity of project and ramifications of proposed wind development on ability of this species to continue to persist. The DEIS/R does not address presence/absence/proximity of potential food sources/attractants of California condor to the proposed project. O1-21

Peninsular Bighorn Sheep

Unfortunately, the DEIS/R fails to provide adequate identification and analysis of the potentially significant impacts to the federally endangered and state fully protected Peninsular bighorn sheep (PBS). While the DEIS/R recognizes that the project is not within the currently designated critical habitat for peninsular bighorn, it fails to acknowledge that the projects fall within previously designated critical habitat. Currently, the Center for Biological Diversity, Sierra Club and others are challenging the 2009 designation in court. We provide the attached map showing the current 2009 and previous 2001 final critical habitats for the Peninsular bighorn. As proposed, the project currently overlaps with habitat previously designated as critical for the survival and recovery of the Peninsular bighorn particularly essential alluvial fan habitat. Moreover, Peninsular bighorn range into areas outside of currently or previously designated critical habitat and use alluvial fan habitat and lower elevation habitat in critical early spring months when forage at higher elevations is not yet available. Therefore, regardless of the current designation, the project will impact habitat for this imperiled species. O1-22

The proposed project site not only will fragment crucial lower elevation foraging areas for Peninsular bighorn, but will also fragment and impact migration routes from the Jacumba mountains to lambing areas in the Coyote mountains, so the DEIS/R needs to identify this issue and re-design the project to avoid impacts. Because these data and subsequent analysis are lacking for this imperiled species, the DEIS/R fails to comply with CEQA or NEPA.

By assuming that Peninsular bighorn sheep were not and in the future will not be present on the proposed project site, the DEIS/R fails to evaluate the impact on the species from increased human activities and the wind towers themselves particularly regarding noise. While no published literature is available on the effects of wind towers on activities of bighorn sheep, data does exist that indicates increased human presence and noise cause sheep to avoid portions of habitat.[5]

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[5] Papouchis et al. 2001.

Additionally, incomplete analysis was provided on the cumulative impacts to the PBS from this and the adjacent proposed and construction projects including Sunrise Powerlink transmission line, Tule Wind project, Imperial Solar project and others that have potential significant impact on the Peninsular bighorn. The combination of these projects significantly narrows the movement corridor for bighorn in this area. The cumulative analysis also fails to assess the metapopulational impacts from not only these proposed projects, but the projects in Mexico, which will likely cut off the remaining connectivity between Peninsular bighorn sheep in Baja and the United States, further isolating both populations which will cause continued declines on both sides of the border for this iconic species. O1-23

Because of the short-comings in the CEQA/NEPA review, the Corps would be wise not to rely upon the DEIS/R as the environmental review on which to base its evaluation for permit.

Barefoot Banded Gecko

The surveys for the barefoot banded gecko are incomplete, because, as the DEIS/R recognizes, not all of the impact area has been surveyed to required protocol levels (Appendix D1 at 13). Clearly the project NEPA/CEQA is rushed and incomplete if necessary surveys have not been completed and provided for public review. The results of the surveys need to be included in a supplemental or revised DEIS/R. O1-24

Flat-tailed Horned Lizard

Declines in populations of and habitat for the flat-tailed horned lizard were noted for decades resulting in a proposed listing of the species in 1993. Several legal challenges have resulted in the U.S. Fish and Wildlife Service reviewing data to determine if the species needs federal Endangered Species Act protection and recently found that is does not warrant listing based in part on conservation measures in place in the California Desert. In the more than 15 years since this listing was first proposed in 1993, the threats to the flat-tailed horned lizard have only increased. Clearly the lizard is still in decline, and the Flat-tailed Horned Lizard Management Areas, the voluntary conservation agreement that has been in place since 1997 and the Rangewide Management Strategy (2003) are not sufficient to protect the survival of the species or contribute to its recovery. Moreover, threats to the species are increasing and are abundant throughout its range. O1-25

The flat-tailed horned lizard is particularly at risk due to its increasingly limited geographic range, its specialized and highly fragmented habitat, its sensitivity to anthropogenic effects, its narrow breadth of diet (almost exclusively harvester ants), and the lowest rates of reproduction of all known horned lizards[6]. All of these factors highlight the potential risk of local and regional extinctions for this species and the significance of any additional destruction of its remaining habitat.

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[6] Barrows and Allen 2009

Damage to habitat from off-road vehicles has continued in all flat-tailed horned lizard areas, including the Yuha Desert, Coachella Valley, West and East Mesas, near the Algodones Dunes, and near Yuma as well as in other flat-tailed horned lizard habitat. There is increasing ORV use of designated routes as well as increased route proliferation in many areas both within the FTHL Management areas and in lizard habitat outside of these areas. These ongoing and increased impacts remain one of the greatest threats to species survival along with habitat loss from development. Off-road vehicle use and route proliferation both cause direct loss of habitat and increasingly fragment remaining habitats. Habitat fragmentation is a significant factor in decreasing flat-tailed horned lizard survival and may preclude recovery in many areas. A study of flat-tailed horned lizards and other species within a conservation areas found that edge effects from roads had a significant impact on flat-tailed horned lizard populations up to 150 m from roads (as well as impacts from increased predation). Barrows et al. (2006); *see also* Barrows and Allen (2009) (discussion of habitat loss and high degree of fragmentation in remaining habitats).

Several renewable energy projects are proposed within flat-tailed horned lizard habitat including the proposed project here which includes thousands of acres of flat-tailed horned lizard habitat and the Imperial Valley solar project. This project could also further fragment the remaining habitat for the species and will cumulatively decrease gene flow between the West Mesa and Yuha Desert area populations. In addition, there are at least another 5 pending right of way applications for both solar and wind projects covering more than 20,000 acres in areas that may include significant lizard habitat some of them adjacent to the management areas.[7] Each of the proposed energy projects will require a new gen-tie power lines that will likely impact lizard habitat and many may also require new substations and other infrastructure that may directly affect lizard habitat. Moreover, these large-scale, single-use projects will displace other multiple uses on public lands and increase the pressure on the FTHL Management areas and other lizard habitat from ORV use.

O1-25, cont.

Loss of habitat due to urban sprawl development and farming was the largest historic threat to the flat-tailed horned lizard. One new sprawl development proposal that may impact flat-tailed horned lizards and their habitat in Imperial County is the Travertine Point which proposes 12,000 housing units on nearly 5,000 acres adjacent to the Salton Sea.[8] In addition, the renewable energy projects, as discussed above, represent another kind of sprawl development that threatens the survival of the species through direct loss of habitat as well as increasing fragmentation of habitat. For this reason, our conservation groups and others have advocated for siting the new renewable energy projects on previously degraded sites in the desert habitats (including fallowed farmlands). While we are cognizant that wind projects are sited for the best wind resources, nonetheless alternative siting should have been more fully considered here.

The flat-tailed horned lizard has largely been extirpated from the Coachella Valley outside of existing conservation areas and the little remaining habitat in Coachella Valley continues to be lost to sprawl development. Problems with small reserve size, invasive weeds, loss of sand sources, and boundary effects suggest the current Coachella Valley reserve will not ensure the survival of the flat-tailed horned lizard in the Coachella Valley. Barrows et al. (2006) noted the significant "sink" effect along the boundary areas and cautioned "Without immigration from the preserve core, flat-tailed horned lizards may not be able to sustain populations in the boundary region." This same concern regarding boundary effects arises for the management areas where routes already fragment the management areas and where additional development is proposed on the borders. This project could similarly limit the effectiveness of the FTHL Management areas by fragmenting the habitat and cutting off connectivity between areas.

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[7] *See* maps and data available on BLM website for renewable energy projects at http://www.blm.gov/ca/st/en/fo/cdd/alternative_energy.html

[8] Documents available at http://www.tlma.co.riverside.ca.us/planning/content/temp/sp375.html

The Sunrise Powerlink powerline project is also directly impacting lizard habitat. This project increases the likelihood that other proposed energy projects will be built in areas that will directly affect the lizard including the proposed project. Powerlines also provide perches for raptors which then prey on the flat-tailed horned lizards, putting further unnatural predation pressures on this declining species. [9] **O1-25, cont.**

On-going and increasing impacts to flat-tailed horned lizard habitat near the US-Mexican border in CA and AZ are also of concern particularly off-road vehicle use by border patrol agents (and others). Border Patrol 'tire drags' of dirt roads in lizard habitat are also a problem and continue to kill or injure lizards. The spread of non-native mustards and other invasive plants may also threaten flat-tailed horned lizard habitat viability. Even if exotic plant species do not directly change the habitat character or decrease food sources, many of these invasive weed plants can support and spread fire that could kill or injure lizards in an area where fire would naturally be an extremely rare occurrence (Brooks et al. 2004). The proposed project and its associated gen-tie lines could also greatly increase the likelihood of fire and the impacts to the lizard and other wildland resources should have been considered in the DEIS/R but were not. **O1-26**

Many of the existing and proposed development projects including the proposed project as well as ORV use will increase the likelihood of predation of flat-tailed horned lizards further diminishing their numbers and ability to survive. Barrows et al. (2006) found a significant increase predation in their study of boundary effects. Increased development provides new roosting and nesting sites for predators including for example shrikes and kestrels which are known predators of the flat-tailed horned lizard. It is well established that increases in subsidies from human activities which provide additional water sources and food/trash also increase other potential predators such as ravens. **O1-27**

Threats to the flat-tailed horned lizard from climate change are significant for several reasons. First, a recent study shows that desert areas may be some of the first affected by increasing temperature and that the changes may be more rapid in these ecosystems making adaptation more difficult[10]. Second, the existing and likely increasing fragmentation of the lizard's habitat by the proposed project and others will make any adaptation through movement across the landscape far more difficult. Thus, the flat-tailed horned lizard although adapted to hot desert environments may nonetheless be significantly impacted by climate change due to its loss of habitat and the constraints on adaptation. **O1-28**

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[9] Barrows et al. 2006.

[10] Barrows et al 2009

O1-29 While the FTHL Rangewide Management Strategy (2003) established Management Areas for the conservation and recovery of the flat-tailed horned lizard, it fails to include connectivity corridors that will help to ensure genetic viability of the core Management Areas. The proposed project site clearly supports significant populations of flat-tailed horned lizard – an estimated 2000 – 5000 animals or 0.32-0.81 lizards/acre which provides an important linkage between the adjacent management areas (Yuha and West Mesa).

O1-30 Impacts to the flat-tailed horned lizards and other affected species must be avoided where possible through a robust alternatives analysis and any remaining impacts should be minimized and mitigated. O1-31 Furthermore, no mitigation for impacts to flat-tailed horned lizard and its habitat are identified in the DEIR/S. Mechanisms need to be included to assure that any and all mitigation acquisitions will be conserved in perpetuity for the conservation of the flat-tailed horned lizard. If those acquisitions are within existing Management Areas, higher levels of protection than are currently in place for Management Areas need to be put in place. NEPA mandates consideration of the relevant environmental factors and environmental review of "[b]oth *short- and long-term* effects" in order to determine the significance of the project's impacts. 40 C.F.R. § 1508.27(a) (emphasis added). O1-32 Corps cannot rely on the DEIR/S provided by other agencies which have clearly failed to consider all of the relevant significant effects in this instance with respect to the impact to the flat-tailed horned lizard.

Burrowing Owl

O1-33 The DEIS/R notes that burrowing owls are located in the proposed project area (DEIS/R at 3.23-5). Preliminary results from the 2006-7 statewide census identified that the Sonoran desert harbors few Western burrowing owls.[11] Even more worrisome is the documented crash of burrowing owls in their former stronghold in the Imperial Valley. The Imperial Valley has had a recently documented decline of 27% in the past 2 years[12], resulting in an even more dire state for burrowing owls in California. Because burrowing owls are in decline throughout California, and now their "stronghold" is documented to be declining severely, the burrowing owls on this proposed project site (and on other renewable energy projects) become even more important to species conservation efforts. The recirculated or supplemental DEIS needs to evaluate the potential impact of the proposed project on this regional distribution of owls.

O1-34 While habitat acquisition specifically for burrowing owls as identified in the DEIS, the proposed mitigation of only 6.5 acres per "active burrow" is too low (DEIS at 4.21-5), especially in the Colorado Desert, as it is outdated agency guidance. Mean burrowing owl foraging territories are 242 hectares in size, although foraging territories for owl in heavily cultivated areas is only 35 hectares[13]. Regardless, the acquisition of only 6.5 acres (2.6 hectares) per "active burrow" fails to mitigate for one bird even if it was relying on a heavily cultivated area. Therefore, additional mitigation acreage needs to be required – calculated using the mean foraging territory size times the number of owls. Using the average foraging territory size for mitigation calculations may not accurately predict the carrying capacity and may *overestimate* the carrying capacity of the proposed project site – it may be that in this area of the Colorado desert 15,000+ acres is necessary to support 20 burrowing owls. While the DEIS relies on guidance from CDFG from 2003, that guidance is now out of date in light of identified population declines[14], a more thorough census of burrowing owls throughout the state[15] and additional research on the species habitat[16]. Lastly, because the carrying capacity is tied to habitat quality, language should be included that mitigation lands that are acquired for burrowing owl be native habitats on undisturbed lands, not cultivated lands, which are subject to the whims of land use changes. The long-term persistence of burrowing owls lie in their ability to utilize natural landscapes, not human-created ones. **O1-34, cont.**

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[11] IBP 2008

[12] Manning 2009.

[13] USFWS 2003

While "passive relocation" does minimize immediate direct take of burrowing owls, ultimately the burrowing owls' available habitat is reduced, and "relocated" birds are forced to compete for resources with other resident burrowing owls and may move into less suitable habitat, ultimately resulting in "take". Other renewable energy projects in the area have been required to construct two burrows for every burrowing owl burrow destroyed. **O1-35**

Bats

The DEIS/R is woefully inadequate in assessing potential impacts to bats. It fails to identify the most deadly menace that wind projects pose to this species which is barotrauma.[17]

The DEIS/R states that no bat roosts were found on site, but completely fails to evaluate bat foraging on site. In addition, the DEIS/R fails to address a potential impact that could be avoided – the color of the turbine towers. Studies have shown that the color of the typical turbine towers is key in attracting insects on which bats prey at significantly higher levels.[18] Additionally data suggest that bat mortality at tall wind turbines is directly linked to nocturnal insect migrations[19], yet this issue is also not addressed in the DEIS/R and needs to be included in a supplemental DEIS/R. With the numerous bat species that are currently foraging on the project site, the impact analysis is woefully inadequate. **O1-36**

Water Quantity and Quality

As the Corps should be aware, the Ocotillo-Coyote Wells Aquifer was designated as a sole source aquifer on September 10, 1996. 61 Fed. Reg. 47752-53. The EPA determined that the aquifer "serves as the 'sole source' of drinking water for the residents of Ocotillo, Coyote Wells, Yuha Estates and Nomirage." *Id.* at 47753. Further, the EPA determined that the aquifer should be protected because "[t]here is no economically feasible alternative drinking water source near the designated area." *Id.* As the EPA noted the boundary of the sole source aquifer area at the Elsinore Fault "separates the sole source aquifer area, which contains high quality, **O1-37** potable water, from high saline, non-potable water to the east of the fault." *Id.* This designation protects this aquifer from contamination by all activities whether by actively polluting the water source or by degradation of water quality due to excessive pumping and overdraft.

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[14] Manning 2009
[15] Wilkerson and Siegel 2010
[16] USFWS 2003
[17] Baerwald et al. 2008.
[18] Long 2011.
[19] Rydell 2010

The newly-proposed use of groundwater for both construction and operation of the proposed project for some length of time could impact existing uses by local communities for drinking water and domestic use and at the expense of other environmental resources as well. Cumulative impacts of this use along with other proposed uses (including existing water use by the Plaster City plant; the proposed expansion of the plant, gypsum mining activities, new well and railroad upgrade; and the Imperial Solar Project) must be identified and analyzed as well. Impacts of the overdraft of this aquifer and use of groundwater by the proposed project must be fully analyzed including impacts such as drawdown of springs and creeks in the area and the impacts to the fragile biological resources of the region that could result including resources in the and San Sebastian Marsh/San Felipe Creek Areas of Critical Environmental Concern (ACECs). Any drawdown of the aquifer would have substantial effects on water supply for other existing users. Moreover, issues regarding use of the water in this aquifer have been in litigation for several years, including issues regarding the possibly catastrophic impacts loss of reliable well water would have on existing communities. **O1-37, cont.**

Key Plans Not Provided

The DEIS/R relies on numerous "conservation" plans for on-site resources, however only two of these plans are actually provided for public review (Draft Golden Eagle Conservation Plan and Draft Avian and Bat Protection Plan) and they are *draft* plans only. Absent finalized plans which the wildlife agencies have approved, it remains unclear if the "conservation" plans are actually adequate to minimize and mitigate the consequential impacts. And as noted above, because all of the significant impacts have not yet been identified and analyzed these plans cannot be adequate and must be updated once additional, supplemental environmental review is prepared and circulated for public review. **O1-38**

Increased Access

Currently the proposed project site does not have many roads and is therefore relatively intact and not readily accessible to motorized vehicles. Developing roads for tower installation will have significant indirect impacts on the natural and cultural resources, because it will provide increased access to areas that currently are only accessible by hiking. Additional roads increase the need for BLM law enforcement activities which are already woefully inadequate. This significant impact is inadequately addressed and remains unmitigated in the DEIS/R. **O1-39**

General Mitigation Acquisition Requirements Are Flawed

The mitigation strategy is inadequate and biologically flawed because it proposes to develop the core habitat for the rare and threatened species and mitigate through acquisition of compensation lands. The generalized strategy of a mitigation ratio for impacts to specific species is proposed to mitigate a multitude of other species – burrowing owl, golden eagles, **O1-40** migratory/special status species birds, badger, and rare plants. Furthermore, the DEIS/R actually fails to require that acquired mitigation lands must be habitat for the specific impacted species. Because any acquired habitat is likely to be already inhabited by the same species for which mitigation is sought, this mitigation strategy ensures a *net decrease* in habitat for impacted species. To actually provide mitigation that staunches species' habitat losses, mitigation ratios must actually address the impacts to each species and must be high enough to fully mitigate the impacts to those species.[20] A *minimum* 5:1 mitigation is more appropriate for all habitat impacts to assure, not only that the project impacts are mitigated, but that the net losses of habitat for rare species are stopped. **O1-40, cont.**

Conclusion

The Notice and the DEIS/R on which the Corps relies, are inadequate both because they omit important information regarding significant impacts and fail to consider a range of alternatives that will avoid the impacts to water resources and water quality from dredge and fill activities, and significant impacts to other resources from the proposed project. The conservation groups urge the Corps to work with the BLM and other responsible agencies to revise the environmental review documents and to issue a revised Notice for public review in the future.

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Attachment:

Map prepared by the Center for Biological Diversity showing 2001 and 2009 critical habitat designations and the proposed project footprint.

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[20] Moilen et al. 2009, Norton 2009

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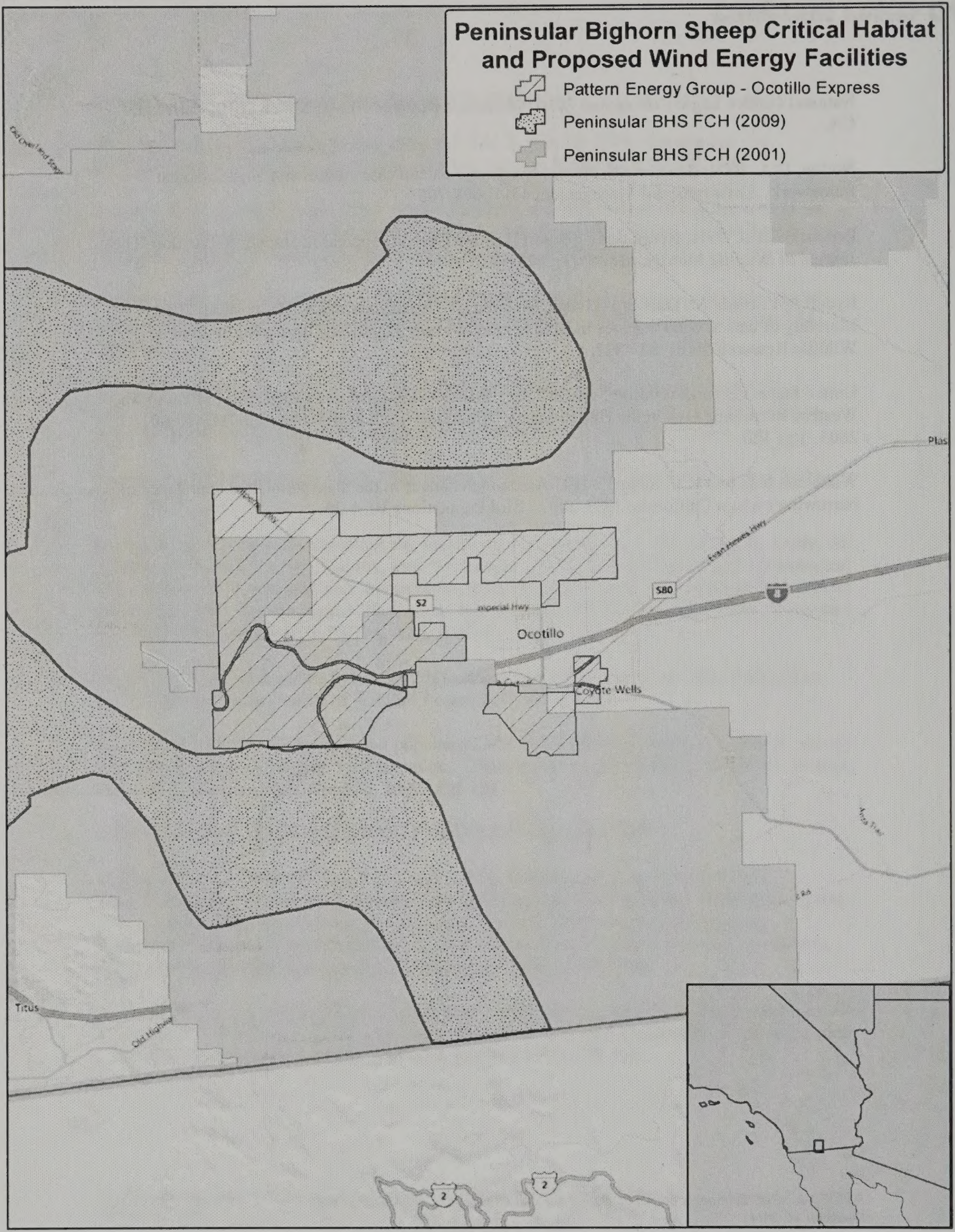
Peninsular Bighorn Sheep Critical Habitat and Proposed Wind Energy Facilities
Pattern Energy Group - Ocotillo Express
Peninsular BHS FCH (2009)
Peninsular BHS FCH (2001)
S2
Imperial Hwy
Ocotillo
Coyote Wells
S80
8
Evan Hewes Hwy
Plas
Titus
Old Highway
Anza Trail
2
2

Comment Letter O2

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CALIF. DESERT DISTRICT
MORENO VALLEY, CA

September 30, 2011

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

SUBJECT: Proposed Ocotillo Wind Energy Facility

Dear Mr. Perry,

The Anza-Borrego Foundation (ABF), with its membership of 1,800 households is concerned about the proposed Ocotillo Wind Energy Facility that is sited directly adjacent to Anza-Borrego Desert State Park (ABDSP). ABF is a nonprofit corporation with a mission to support ABDSP. While ABF supports the development of renewable energy sources, such as wind and solar, we advocate for distributed generation, the concept that this energy should be generated closer to the population centers that will consume it. **O2-01**

This 12,000 acre development would mar the view shed of Anza-Borrego Desert State Park from many overlooks that are popular with hikers in the park. And the famed experience of the desert, the silence, the darkness, and wide vistas would be forever changed in lands that directly border wilderness designated areas. **O2-02**

There would also be devastating impacts to biological resources. The highly endangered Peninsular Big Horn sheep now live in and migrate through that area and this huge development can only impact in negative ways. Bird strikes with eagles, hawks and owls, not to mention other birds and bats could be significant. Many ground dwelling species will be threatened as well including lizards, and snakes, burrowing owls. **O2-03**

We are also concerned that the draft EIS does not meet NEPA requirements. It does not appear to consider a full range of alternatives, including distributed generation. There is also not a "no-project" alternative. This must be an option if impacts are considered to be too disastrous. **O2-04**

ABF is opposed to this project, in any form, adjacent to ABDSP. We request that you do not approve this project. **O2-05**

Sincerely,

C.L. Bennett
Board President

Member of EarthShare California

PARTNERS WITH THE PARK

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Ocotillo Wind Express Project
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October 6, 2011

Subject: DEIS Comments for Ocotillo Wind Express

Dear Mr. Perry,

On behalf of the Desert Protective Council, I thank you for the opportunity to submit the following comments on the proposed Ocotillo Express Wind Energy Project Draft Environmental Impact Statement (DEIS) CASE FILE NUMBER: CACA051552 DOCUMENT NUMBER: CA-670-2010-032.

The Desert Protective Council is a 57-year-old Non-Profit 501(c)(3) Membership organization. The mission of the Desert Protective Council is to safeguard for wise and reverent use by this and succeeding generations, those desert areas of unique scenic, scientific, historical, spiritual or recreational value and to educate children and adults to a better understanding of the deserts. Our organization works through education, advocacy and land stewardship. We have members throughout southern California and nationwide.

Request for Comment Period Extension:

We would like to first of all request a time extension of at least thirty days for public comments on this DEIS/DEIR. There were only two public meetings held on this project on August 24th and 25th in Imperial County and no public comments were recorded even taken at these meetings. The meetings were advertised as public hearings and concerned citizens traveled long distances to attend and enter comments on the Ocotillo Express Wind Project into the public record and were frustrated to be treated only to a dog and pony show by the project developers. Spoken comments are the preferred mode for a variety of reasons for some individuals and for Native Americans. Because no comments were accepted at the public meetings, segments of the population were denied the opportunity to participate in the public process in this process. The BLM gave no reason for rescinding this traditional part of the public process. Thus a time extension is warranted. During this extension of the public comment period, meetings should be scheduled in other areas of southern California because this vast and beautiful area is enjoyed by and is important to the pubic beyond just the population in Imperial Valley.

Additionally, the files of the maps in Appendix A posted in the online documents for the project are such huge files that they are very difficult, if not impossible to download on some computers, especially older computers.

O3-01

For those who are not intimately familiar with the area, the ability to view these maps is critical to their ability to make appropriate comments on the project. This is another reason for the need to extend the period for public comment.

O3-01 cont

Purpose and Need:

All BLM alternatives included in the industrial wind proposals are defined by a Need reflecting the recent Secretarial Order 3283: Enhancing Renewable Energy Development on Public Lands. The goals of Section 4 in Secretarial Order 3283 clearly state a need for environmental responsibility: *"the permitting of* ***environmentally responsible*** *wind, solar, biomass, and geothermal operations and electrical transmission facilities on the public lands;*

The only environmentally responsible alternatives for the Ocotillo Wind Express Project are the No Project Alternative and a point of use renewable energy alternative.

That this location *may provide* an adequate wind resource to produce an unknown amount of usable renewable energy is not reason enough to destroy 22 -plus square miles of functioning desert habitat. The visual impacts alone are described in the document at being un-mitigable. This project does not meet the specifications of the Best Management Practices of the National Environmental Policy Act, the Endangered Species Act, and the Federal Lands Management Policy Act, etc and can, in no way, be considered "environmentally responsible".

O3-02

The BLM's Purpose and Need statement in the DEIS quotes FLPMA (section 10 (c)) and claims that *"public lands are to be managed for multiple use that takes into account the long- term needs of future generations for renewable and non-renewable resources."*

How can this project, which proposes taking up to 23 square miles of public land be even remotely considered to be taking into account the long-term needs of future generations? If this project is built, public land access would be extremely limited and other land uses would be precluded. Please explain how FLPMA's multiple-use mandate would be adhered to when so much of the land would be sacrificed for just one use? Mandates to use renewable energy can be met in a distributed generation alternative. . If a large project impairs the BLM's mandate to manage these lands under a multiple use philosophy, the BLM should provide a sound, environmentally friendly alternative, including an alternative that lies out of the jurisdiction of the BLM.

The Purpose and Need statement in this document needs to be expanded to include mandates to protect sensitive biological, hydrological, cultural and visual resources. In the purpose and need statement, there also needs to include a mandate to protect the community character and property values of the community of Ocotillo/Nomirage. There should also be a mandate in the Purpose and Need Statement to preserve the Class L Limited Use designation of the CDCA plan.

Alternatives:

A full range of alternatives should be considered in every EIS document. That is required by NEPA.
Following the guidelines of the National Environmental Policy Act, the final EIS should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision maker and the public. In this section agencies shall:

(a) Rigorously explore and objectively evaluate all reasonable alternatives; for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated.
(b) Devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits.
(c) **Include reasonable alternatives not within the jurisdiction of the lead agency.**
(d) Include the alternative of no action.
(e) Identify the agency's preferred alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference.
(f) Include appropriate mitigation measures not already included in the proposed action or alternatives.
The DEIS provides 6 alternatives, the best being Number 5 which denies the ROW grant and approves a land use plan excluding wind energy from the land use plan. O3-03

The Desert Protective Council requests that the BLM consider additional alternatives for the Ocotillo Express Wind Project, including:

No Action which designates a conservation status to the area: This would be more than just an exclusion of wind energy. This alternative would recognize wildlife habitat and cultural values as resources with high conservation value.

Private Land Alternative outside of Imperial Valley: As mentioned above, under NEPA, the BLM is required to consider off site alternatives for production of wind energy. The California Desert Protection Act Class L designations of the lands on the site should be reason enough to find a better site for this project. We believe that the BLM is in violation of NEPA by failing to consider a private lands alternative.

"Brown-fields" alternative: The US Environmental Protection Agency has identified over one million acres of degraded lands or "brown-fields" in the United States that would be appropriate for large-scale renewable energy development.

Affected Environment/Environmental Consequences:

Air Quality/Climate Change:

The Imperial Valley air basin continues to be in non-attainment by Federal EPA standards for small and large particulate matter and ozone. During construction of this massive project, large diesel trucks hauling sand for mixing concrete for the cement turbine platforms and many more hauling water from remote areas for mitigation of dust from the tons of dust created by scraping the desert of its topsoil, will adversely impact the air quality for miles around. This is unjustifiable in the context of the protection of the public health in Imperial County where the asthma rate is competes for the highest in California. Cumulative impacts on air quality will result from the removal so much stabilized soil and biological soil crust. Photographs from throughout the project proposed site document the well-developed soil crust and desert pavement throughout the site. It is well known that removal of stabilized desert soils and the biological crust creates airborne particulates and erosion. Cumulative impacts on air quality from removal of so many tons of stabilized soil must be addressed in the EIS

O3-04

Examples of air-borne dust are rampant in the Imperial Valley. The EPA has recently informed Imperial County that they need to improve their State Implementation Plan Air Quality Rules by further addressing particulates from dirt roads and from off-road vehicle recreation in the Valley. The particulates added to the poor air quality from construction of this project and the hundreds of miles of additional unpaved roads must be analyzed.

Plants, caliche layers and biological soil crust would all be removed for this project. This will obliterate the desert soil's ability to sequester carbon. The question of whether the amount of C02 offset from wind energy will compensate for the removed caliche formations and organic matter must be analyzed.

Scientists are recommending that the offset of C02 emissions be studied. Whether the new energy plant that will be built as part of this wind project will actually offset greenhouse gases must be thoroughly analyzed.

Water Resources:

The DEIS seems uncertain about the availability of groundwater resources or even if the construction phase of the project would actually draw down the aquifer. The DEIS refers to water being hauled from remote sites. The Ocotillo Wind Project is located in the Colorado River Hydrologic Region, which is a very sensitive and protected resource. Since water resources in the area are not adjudicated, all property owners above a common aquifer possess a shared right to reasonable use of the aquifer. The Ocotillo Wind Express Project could draw down already over-drafted basins including the strapped Coyote Wells Groundwater Basin. Other basins are described as "unknown" in the DEIS.

O3-05

Streambeds:

Streambed alteration can adversely impact localized groundwater recharge. The entire proposed project area both south and north of Highway 8 and northwest of highway S 2 contains an intricate system of braided and serpentine washes. These emanate from the mountains to the west and cross highway S2 and continuing on the east side of S2. Some portions of the washes throughout the area are several feet deep. How will the project proponents avoid disturbing these pervasive washes considering their serpentine quality? No wash travels in a straight line. **O3-06**

Desert Pavement:

Desert pavements are found on alluvial fans and piedmonts below mountains in the Mojave and Sonoran Deserts. Stones over fine sediments may form a weak pavement, in the case of granitic stones at the Imperial Valley Solar Project site which decompose and weather more quickly, or if derived from volcanic or limestone sources, may be densely packed, inter-locking, and resistant. **O3-07**

The project area contains vast stretches of desert pavement. How will the removal of thousands of acres of desert pavement affect the flood potential of the region? How will this alter the local hydrology? Will existing groundwater aquifers see less recharge? Will new locations that catch water be created? How will this impact wildlife and populations of plants that depend on flood water drainage?

Visual Resources:

This project would be built adjacent to the Anza-Borrego Desert State Park (ABDSP) and in the vicinity of outstanding conservation areas and designated wilderness. It is situated on an alluvial fan below 4,000 ft.-elevation mountains to the west and the south. The impact to visual resources will degrade the view shed for many miles around. The project is in the vicinity of the Yuha Area of Critical Environmental Concern, the Coyote Mountains Wilderness Area, the Jacumba Mountains Wilderness Area, and it would be very visible from the community of Ocotillo and all the way to Plaster City. The public lands visitor experience will be seriously degraded. The 13,000-acre size of the project is large and will have the potential to impact different VRM zones of different classes. Much of the public lands in Imperial Valley lands are considered a Class One Visual Resource Management Zone and Anza Borrego State Park has its own standards. BLM defines the objective of this class *"to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention"*. **O3-08**

Wind turbines that tower above 450 feet have a three dimensional impact. It is impossible to mitigate these impacts to the visual resources and for this reason alone, this project could and should be denied.

Dark Skies:

Turbines will be illuminated by red flashing lights all night to conform to FAA regulations. The red aviation lights reflect off of the clouds and create visual impacts at even great distances from the turbines.

We would like to add our request to those of others submitting comments on this project that the following Key Observation Point (KOP) simulations be included in the FIES:

- At least two KOP simulations from different elevations should be provided from the
- Jacumba Mountains Wilderness Area
- At least on KOP simulation from the Yuha Area of Critical Environmental Concern
- At least two KOP simulations from different elevations from the Coyote Mountains Wilderness Area
- At least two more KOP simulations from the community of Ocotillo
- At least four dark sky KOP simulations depicting red flashing aviation lights from Anza Borrego State Park, The Jacumba Mountains Wilderness Area, The Coyote Mountains Wilderness Area and the community of Ocotillo.

O3-09

Socio-Economics/Environmental Justice and Private Property:

This project has economic and environmental Justice problems as well. A few or even a couple dozen local temporary construction jobs may become available but it has been documented that after about three years of construction, an industrial wind project will create only about 10-15 full-time jobs. We support the creation of good, long-term jobs for Imperial County citizens. The IBEW and Imperial Valley College and IVROP have instituted training programs and apprenticeships in the field of electrical and solar engineering. To date, only a handful of people have graduated from these training programs and hopefully the numbers of Imperial Valley skilled workers in the field of renewable energy development will grow in coming years. If Imperial County decides to embrace the concept of point of use renewable energy production such as rooftop solar and local distributed generation, hundreds of good-paying long-term jobs will be created. Industrial-scale wind and solar projects on public land will provide very few local jobs. At the same time, the people of Imperial County will not benefit from the renewable energy produced from their Valley as SDG&E and IID plan to export or "wheel" most of it out of the valley. Meanwhile, the citizens in the Ocotillo/Nomirage Community will lose their community character, their quality of life, their property values as well as their dark skies, their desert quiet and their good air quality days. And the people of the US and of other countries will suffer the loss of protection of the beautiful, wild desert character of Western Imperial County, the loss of the integrity of the area as one of the richest in Native American ancient cultural resources as loss of habitat for local sensitive and endangered plant and animal species, like the Flat-Tailed Horned Lizard, whose last major habitat area left in southern California is in the Imperial County desert.

O3-10

Public Health:

The DEIS for this project lacks any mention of Wind Turbine Syndrome in the public health section. The issue is underplayed in the Noise Section. The DEIS admits that residents of the community of Ocotillo would experience noise from the turbines but includes none of the current research on the impacts of wind turbine noise on human health.

The FEIS must include an analysis of the full potential impacts of noise to public health. **O3-11**

Land Use and Recreation:

All of the public lands in the California Desert Conservation Area (CDCA) under BLM management, except for a few small and scattered parcels (approximately 300,000 acres), have been designated geographically into four multiple-use classes. The classification was based on the sensitivity of resources and kinds of uses for each geographic area. A map depicting the use classification assigned to each location (Map 1) can be found in the back cover pocket of this document. **O3-12**

Multiple Use Class L (Limited Use)

Multiple-Use Class L (Limited Use) protects sensitive, natural, scenic, ecological, and Native American cultural heritage values. Public lands designated as Class L are managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished.

All of the public lands slated for development for this project have been designated Class L lands under the 4 multiple use classifications defined in the California Desert Conservation Area plan. The impacts from this project would be so severe, that the CDCA plan needs to be amended just to approve the project. The unconscionable process to amend the CDCA Plan calls into question whether the American public and the Department of the Interior should even bother to engage in land use planning processes to create special designations for protection of special resources if these painstakingly crafted plans can be jettisoned with a Plan Amendment.

Large projects like Ocotillo Wind are also impacting the multiple use philosophy of the BLM. A 23 square mile project will cut of a significant amount of access for users of public land. As urban populations grow, open space becomes an even more precious resource. **O3-13**

The Conservation Biology Institute prepared *A Framework for Effective Conservation Management of the Sonoran Desert in California* for The Nature Conservancy (2009). There are two companion pieces: *Maintaining a Landscape Linkage for Peninsular Bighorn Sheep* (2010) and the Los Californias Binational Conservation Initiative: *A vision for habitat conservation in the border region of California*. **O3-14**

In the Sonoran Desert Report, Ocotillo Wind is in an area designated Category C: Natural areas or open space that are fragmented by roads, sparse rural residential communities, or other human uses (i.e., areas with relatively low integrity), but which may nonetheless contain conservation targets, provide potential habitat linkages, or provide a buffer around Category A and B lands. The map shows that the Solar Wind project occupies buffer lands for the higher elevation Category A and B lands, which include ABDSP and the Jacumba Wilderness. It is in the ecotone between the Peninsular Mountains and the desert. Internationally, the Jacumba Mountains are the northern tip of the Sierra de Juarez which link to the Sierra San Pedro Martir further south. This long mountain strip is all potential Peninsular Bighorn Sheep habitat within the Sonoran Ecoregion. Ocotillo Wind Express is a landscape level project, and it is potentially an eco-regional disaster. It will fragment habitat regionally and potentially eliminate habitat and species locally. **O3-14 cont**

Plant communities:

The proposed project site has well-established Sonoran Desert plant communities. Plant communities include smoke tree, indigo bush, creosote scrub, ocotillo, lyceum, teddy bear and staghorn cholla, galleta grass and others. The Imperial Valley has seen more development and impacts than most of the California Desert. Intact, old growth plant communities in the Imperial Valley should be preserved because they represent the remaining biodiversity of the region. The removal of well established plant communities through scraping of soil for industrial-scale energy development would increase the spread of invasive weeds like Sahara Mustard, Red Brome Schismus barbutas and Russian thistle. **O3-15**

Rare Plants:

O3-16

Plant surveys found 12 special status plant species on the site. Surveys for rare plants were not conducted in the late summer or early fall at the time of the monsoon season. The October surveys may have been too late to detect some species on the site. Plant surveys did not cover the entire site Right of Way. Surveys were only conducted within a limited diameter around the development.

Below is a complete list of plants that should have been surveyed for on the site:

Abronia villosa var. *aurita*
Amaranthus watsonii
Chamaesyce abramsiana
C. platysperma
Ditaxis serrata var. *californica*
Horsfordia alata
H. newberryi
Penstemon thurberi
Teucrium cubense ssp. *Depressum*

Wildlife:

Page 3.32-1 of the Wildlife Resources chapter says: "Despite the above-mentioned usage, the majority of the proposed OWEF site is relatively undisturbed." To protect wildlife, the No-Project Alternative which designates the area a no -wind zone is best to minimize disturbance. O3-17

Flat-tailed horned lizard *(Phrynosoma mcallii)*

The Ocotillo Wind Express Project will impact a significant portion of the habitat and connectivity of the flat-tailed horned lizard. This species has a very limited range left in the United States and has lost a larger percentage of its habitat in Imperial Valley to agriculture and other human use. The Flat-Tailed Horned Lizard Management (FTHL) Strategy requires that less than 1% of an area of the habitat Area is disturbed. This DEIS has not adequately assessed the potential cumulative impacts to the FTHL habitat from the Sunrise Power link, the Imperial County Renewable Energy Zone, the Ocotillo Sol proposed substation and from the Chocolate Mts. Renewable Energy Evaluation Area as well as from ongoing off-road vehicle recreation use in the Superstition Mts. and Plaster City Open Area and the impacts from military activity in the East Mesa Area. O3-18

Peninsular Bighorn Sheep ***(Ovis canadensis):***

The DEIS has determined that with the exception of the I-8 island portion of the project, the proposed site is not occupied by Peninsular bighorn sheep. This is based on a three-month survey starting in March 2011 and an initial 8-day survey that took place in 2009. The DEIS does not make it clear as to how much of the project ROW application was fully covered by the surveys. Certainly, the 8-day survey could not have covered the whole site.
The Ocotillo Wind Express site represents important foraging and connectivity habitat for endangered bighorn sheep.

The project will block access to large bighorn sheep foraging areas and block connectivity corridors from mountain range to mountain range. Bighorn biologists Dr. John Wehausen and Dr. Vern Bleich have concluded that radio telemetry studies of bighorn sheep in various southwestern deserts have found considerable movement of these sheep between mountain ranges. Consequently, intermountain areas of the desert floor that bighorn traverse between mountain ranges can be as important to the long-term viability of populations as are the mountain ranges themselves. O3-19

Alluvial fans near steep rocky terrain can provide crucial foraging habitat for big horn sheep (Wehausen 2009)

Because this species is Federally Endangered, we believe BLM should require a 5 to 1 ratio of mitigation for the Critical Habitat compensation.

The Ocotillo Wind Express DEIS also admits that the project will alter the behavior of the Endangered Peninsular Bighorn Sheep, but provides very little detail regarding how this would be mitigated. O3-19 cont

.Bats:

The DEIS claims that the project would pose very little threat to bats because the turbines are much higher than the average bat flight elevation. This information is inconsistent with recent literature documenting bat fatalities at major wind farms in the United States. In fact some literature suggests that the taller wind turbines are actually more dangerous for bats. The most recent peer-reviewed scientific literature must be included in analyzing Pattern Energy's proposed project. O3-20

Impacts to Other Protected and Sensitive Species:

Comments submitted on this project by biologists and other wildlife specialists have knowledgeably addressed the impacts to the other important species that inhabit western Imperial County desert areas, including the proposed footprint of this Ocotillo Wind Site. O3-21

The Yuha Desert Native American Cultural Resource Area includes the area north, west and south of the designated ACEC. The Ocotillo Wind project will impact the integrity of the entire Yuha Basin and the spiritual integrity of the historical and cultural resources. Impacts to historical and cultural resources cannot be mitigated. The richness of resources of Imperial County cannot be replaced and the DEIS does not address the loss to local, national and world-wide present and future generations of the Imperial County's important natural and cultural heritage. O3-22

The BLM must choose a No-Action Alternative in order to fulfill its mandate to protect and preserve these lands for present and future generations.

Please keep the Desert Protective Council on your mailing list for all notices of meetings and documents related to the Ocotillo Wind Express Project. O3-23

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To:
Cedric Perry, BLM Project Manager
California Desert District

October 4, 2011

RE: Ocotillo Draft EIS/EIR

Dear Mr, Perry:

I have read over the Ocotillo Draft EIR/EIS and supplemental documents ("the EIR"). As an expert on birds of prey, I can testify that the EIR does not fulfill the State's requirements to fully disclose the expected impacts of the windfarm project on birds and bats. I found the EIR to be a lengthy collection of observations and information written with deliberate vagueness. In my opinion its main achievement is to provide a list of avian and bat species that will be killed, and to show how access to this information will be controlled. Regarding impacts on sensitive wildlife species considered cumulatively with other windfarms built or projected in the State, the EIR does not even mention them. **O4-01**

I have many reservations about the EIR, but will only discuss some of the major issues. For example, it doesn't provide any useful information about the Golden Eagle, a threatened species whose conservation status is obsolete, dating back 10 years. The authors measure the eagles to be impacted by the Ocotillo project against outdated, irrelevant, and vague San Diego county population data. The reason given is: "We are not aware of golden eagle population data from Imperial County" (which is where the project is located). Most importantly, they fail to point out that the project site lies in some of the best habitat available to the golden eagle in this entire desert region. Thus, without any information about the bird's population for the entire 4284 square miles of Imperial County, it is not possible to assess the importance of the project area to the eagles. My estimate is that the eagles at risk because they live within 15 km of the proposed wind turbines represent 25-30% of the golden eagles living in Imperial county. This is very significant. **O4-02**

The EIR states "The golden eagle population appears to be declining". There is some truth in this statement and a little bit of truth in the reasons given for this decline. But there is also a serious omission: the main reason for the Golden Eagle's rapid decline is the proliferation of wind farms in California and beyond over the last ten years. Yet not a single word about this impact is mentioned in the EIR. **O4-03**

There is a great deal of cover up going on about the decline of the golden eagle population in California. If one looks at the Altamont Pass wind farms, it was claimed a few years ago that there were 59 pairs of eagles nesting within 19 miles of Altamont Pass. But no one will say that there may be no more than 8-10 nesting pairs today. If confirmed, this figure would represent an 85% decline. But there are no recent studies to document it. Neither the government agencies, nor the wind industry, are eager to let this information out, lest the public understand how harmful windfarms are to biodiversity.

It is well known that many golden eagles get killed by wind turbines. These birds, like many other raptors, prefer windy areas because it makes their soaring and gliding easier. But windfarm developers are also looking for windy spots, and that puts wind turbines and raptors on a collision course. Other reasons include the fact that the diet of raptors is often supplemented by scavenging. Wounded or freshly killed birds to be found under wind turbines will always attract eagles and other scavengers to within striking distance of the turbine blades. This scenario creates an endless death/death cycle that will continue as long as propeller-style turbines are used by the wind industry. Again, none of this crucial information is mentioned in the EIR.

The golden eagle population is actually much lower than what is claimed in the EIR. I have seen the inflated population figures that have been produced by experts in the pay of the wind industry. My own estimates for California are now in the range of 500-700 golden eagles, with about 100 being killed by wind farms each year. More information on the bogus population studies financed by the wind industry may be found in my editorial of April 2010: "GOLDEN EAGLES FALL PREY TO WIND INDUSTRY". O4-03 cont

The Burrowing Owl is another species in decline that will be slaughtered throughout the life of the Ocotillo project. Once again, where are the comparative impact studies and current population figures? At Altamont Pass this species has been slaughtered by the thousands. O4-04

White-tailed kites, raptors of a protected species also to be found in Imperial County, will at some time be killed during the life of project. Yet the White-tailed Kite is not even mentioned in the EIR and it is one of the most vulnerable of all raptors due to its hunting behavior. Pattern Energy, Inc. will probably counter my statement by saying there are no documented wind turbine fatalities including white-tailed kites in California. But keep in mind these turbines kill everything that is forced to live with them. There is an unavoidable comparison that can be made with the Red Kite. It is a very similar species in size and habits, one which has been recorded as being slaughtered by wind turbines all over Europe. Yet in the 30-year history of California wind farms, no wind farm has come forward with evidence of white-tailed kite casualties. It is not because it does not happen. O4-05

The Merlin radar studies presented in the EIR are worthless, except for telling us in what season and at what time of day we can expect the highest number of casualties from collisions. I also studied maps of the project area, and in my opinion the radar was set up in an area of the project site where it would collect the least bird activity in the rotor sweep area. O4-06

There is also no data in the radar study that shows use of the site in the 0-50 meter vertical range. This is an important omission, because most bird species spend the majority of their lives in this range, and they are at risk when flying upward. If this bar were on the graph submitted, it would be off the page.

The Ocotillo plan cites no successes anywhere in the world where radar has been used to protect birds at wind farms. Pattern Energy's use of radar on their Kenedy ranch wind project in Texas, is a failure: thousands of birds and bats have been reported killed in the short history of this wind farm and thousands more remain unreported due to flawed mortality studies.

O4-06 cont

The use of Radar at Ocotillo will fail due to several reasons; human error, blind spots, interference, smaller birds being excluded from protection, flights upwards from below the rotor sweep zone, the far too long 60-second shut down time, and a greed-driven reluctance to shut down the turbines. These are the major problems with the use of radar and none of this was discussed in the EIR. I will also add that a falcon or eagle can travel 4 miles in a minute. I have seen it in the field and for this reason the 60 second shut down time is unacceptable. Another problem is that the mortality figures will never be credible, because an ornithologist paid by the developer will be in control of the information.

O4-07

The CEQA was enacted in 1970 to provide for full disclosure of environmental impacts to the public before issuance of a permit by State or local public agencies. In addition to federal or State listed species, "sensitive" plants and animals receive consideration under CEQA. In response to concerns about wildlife impacts resulting from the development of the project, a variety of field studies and literature reviews were initiated. Having dealt with a multitude of bogus reports generated by the wind industry, I would recommend that every study submitted on behalf of any windfarm project be viewed with disbelief. It is simply absurd that developers along with their mercenary experts be entrusted with the assessment of the damage their own projects will do to the environment. A child of ten could see thru this charade. No wonder the golden eagles are disappearing.

Among the important information left out of the EIR is this one: the speed of the blades, at their tips, will be 212 mph at 16 rpm. No bird or bat will be quick enough to get out of their way in time. After all, birds do get hit by cars moving at 60 mph.

Jim Wiegand
Vice President USA, Save the Eagles International
http://www.savetheeaglesinternational.org

From: HILDY CARRILLO [mailto:calexicochamber@hotmail.com]
Sent: Wednesday, October 05, 2011 2:54 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Project

Mr. Perry

On behalf of myself and the Board of Directors of the Calexico Chamber of Commerce I would like to inform you of our support of Pattern Energy and the Ocotillo Wind Project. We are working closely with Pattern Energy to assist in promoting much needed economic development in our region. The project will not only create local business activity and jobs, it will also produce clean energy for our region. **O5-01**

Sincerely,

Hildy Carrillo
Executive Director
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Comment Letter O6

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September 30, 2011

Ocotillo Wind Energy Facility DEIS/DEIR Comments
c/o Cedric Perry, Project Manager
Bureau of Land Management
California Desert District Office
22835 Calle San Juan de Los Lagos
Moreno Valley, CA 92553
caocotillo@blm.gov

Ocotillo Wind Energy Facility DEIS/DEIR Comments
c/o Angelina Havens, Planner III
Imperial County Planning & Development Services
801 Main Street
El Centro, CA 92243
angelinahavens@co.imperial.ca.us

Re: Ocotillo Express Wind Facility Comments

Dear Cedric Perry and Angelina Havens:

The El Centro Chamber of Commerce & Visitors Bureau supports Pattern Energy's proposed Ocotillo Wind Project. We endorse the Ocotillo Wind Project because it will increase local business and produce clean energy for California.

Pattern is a leader in the renewable energy industry with a reputation for using innovative mitigation measures to protect the environment and wildlife. The Ocotillo Wind project will be an economic stimulus for the region and produce clean energy equal to the needs of 140,000 homes. The project would create up to 300 jobs during construction and up to 30 during operation, provide business for local contractors, and contribute significantly to local tax revenues.

Pattern has proven they are committed to the communities near their projects by providing funding for local programs and sponsoring events important to our communities. Pattern donated to the Imperial Valley School District to keep Westside Elementary school open, restarted the IV Food Bank's school backpack program at Westside Elementary, and contributed to the IV Desert Museum to complete their lab and to the Ocotillo Optimists for their graduate school program and a fence around the basketball court at the Ocotillo Community Park. Pattern has pledged to continue to contribute further to local programs through the Ocotillo Wind Project. O6-01

The Chamber believes the permit application for the Ocotillo Wind Project is thorough and addresses concerns raised during the scoping process. We endorse Pattern's Ocotillo Wind Project because it will bring economic, environmental and community benefits to the Imperial Valley.

Sincerely,

Cathy Kennerson

Cathy Kennerson, ACE
Chief Executive Officer

"Where the Sun Spends the Winter"®

Audubon CALIFORNIA

SAN DIEGO AUDUBON SOCIETY

October 6, 2011

Mr. Cedric Perry, Project Manager
Bureau of Land Management
California Desert District Office
22835 Calle San Juan de Los Lagos
Moreno Valley, CA 92553
Via email: Cedric_Perry@ca.blm.gov

Re: Ocotillo Express Wind Project (CACA051552)

Dear Mr. Perry:

Audubon California is the state office of National Audubon Society with 150,000 members and supporters in California. Audubon's mission is to conserve and restore natural ecosystems, focusing on birds, other wildlife, and their habitats for the benefit of humanity and the earth's biological diversity. For more than a century, Audubon has built a legacy of conservation success by mobilizing the strength of its network of members, Chapters, Audubon Centers, state offices and dedicated professional staff to connect people with nature and the power to protect it.

The mission of the **San Diego Audubon Society (SDAS)** is to foster the protection and appreciation of birds, other wildlife, and their habitats, through education and study, and to advocate for a cleaner, healthier environment. Originally founded in 1948, SDAS has been bringing people and nature together in the San Diego region for over 60 years. SDAS has approximately 2,500 members and over three hundred volunteers, all of whom live near the proposed Ocotillo Express Wind project site.

In recognition of the growing threats to human and ecological communities presented by the release of greenhouse gases and the resultant climate change, we have championed the aggressive development of both energy conservation and renewable energy generation to reduce those threats. In locations throughout our state Audubon at the state level, and our chapters at a local level, have successfully collaborated on the development of renewable energy facilities - striking a balance between landscape conservation priorities and renewable energy development.

We offer the following comments on the joint Draft Environmental Impact Report/Draft Environmental Impact Statement (DEIR/DEIS) for the Ocotillo Express Wind Energy Project (CACA051552) on public and private lands in Imperial County:

1. The range of alternatives in the NEPA and CEQA analysis is not adequate, is unnecessarily restrictive, and unreasonably narrows the alternatives to the objectives of the Project Applicant rather than a range of alternatives for the "production and transmission O7-01

of energy in a safe and environmentally sound manner" as authorities granted to BLM require.

The BLM is required to consider a range of alternatives that are considered "reasonable," usually defined as alternatives that are realistic (not speculative), technologically and economically feasible, and responsive to the purpose and need of the project.

However BLM in ES 2.1. unreasonably restricts the alternatives analysis by stating the purpose and need of the project as "to respond to a FLPMA ROW application submitted by the Applicant to construct, operate, maintain, and decommission a wind energy-generating facility and associated infrastructure on public lands administered by the BLM in compliance with FLPMA, BLM ROW regulations, and other applicable Federal laws and policies."

This is contrary to the authority granted BLM by federal policy cited further in the Document's ES 2.1 including the Energy Policy Act 2005, Executive Order 13212, and Secretarial Order 3285A1, and is contrary to the intent of NEPA and CEQA.

O7-01 cont

Dismissed in the alternatives analysis are renewable energy generation and transmission projects on lands that are previously disturbed, conjunctive use of public and private lands, energy generation projects such as distributed generation, conservation and demand side management. These alternatives are dismissed with the unreasonably narrow criteria *"Does not meet the project purpose and need (wind power generation)."*

O7-02

The Document also unfairly dismisses Alternative 3 and offers unfair support for the Applicant's proposed project by stating *"While physical impacts on the environment at the project site would be reduced with Alternative 3, this alternative would not fully meet the project's objectives as it would only enable the generation of approximately 315 MW of wind energy rather than the 465 MW sought by the Applicant."*

We note that since Applicant has determined that the project will be built with 2.3 MW turbines and that the maximum number of turbines applied for is 155, then the maximum MW generation of the project if approved without modification is 356.5 MW not 465 MW as calculated in the Proposed Action that the BLM has chosen as the preferred alternative. This is closer to Alternative 3 than BLM's chosen alternative, and suggests that the Alternatives Analysis should be revised.

O7-03

There are no requirements in NEPA or CEQA or federal policy that alternatives should be dismissed that do not meet the goals of the Applicant.

O7-04

The stated alternatives criteria in the Document are: *"These criteria were used to evaluate whether a potential alternative would: achieve the project purpose and meet most project objectives; be feasible; and offer environmental advantages over the proposed project, including avoidance or reduction of significant environmental impacts."* According to this criteria, Alternative 3 could meet most project objectives, be feasible and offer environmental advantages over the proposed project, including avoidance or reduction of significant environmental impacts, yet is prejudicially dismissed by the Document in favor of Applicant's objectives without analysis.

O7-05

O7-06

Since the most significant impact on biological resources of the Project is collision of birds and bats with turbines, the alternatives analysis should include a comparison of the turbine rotor swept area and the barotrauma airspace for bats of the different alternatives, with a comparison of the projected mortality over the life of the project of the alternatives, especially of sensitive and protected species.

Without this comparison of significant impacts and a wider range of alternatives, the alternatives analysis is seriously flawed.

O7-07

2. The analysis of impacts on biological resources is inadequate, and mitigation for those impacts is inadequate and/or improperly deferred. The most significant impact of the project on biological resources is turbine collision mortality of birds and bats over the thirty-year life of the Project, yet this impact is inadequately analyzed and the mitigation provided is inadequate.

a. Golden Eagle

The Document reports *"During the 2010 occupancy surveys, 21 Golden Eagle nests were observed that accounted for five Golden Eagle territories, 2 of which were considered active territories in 2010 (i.e., Coyote Mountains West and Table Mountain). One nest in Coyote Mountains West showed signs of early activity in 2010, but no eggs or incubating adults were observed at the nest site. Two nest sites in the Table Mountain territory showed possible signs of activity in 2010, but no eggs or incubating adults were observed."*

O7-08

The Document rightly qualifies the analysis with *"Without knowing the effects of the drought on Golden Eagle breeding, one might come to a false conclusion about the population of Golden Eagles within the survey area. Because breeding in southern California begins in January, and this survey was initiated in late March when only those eagles that were successful would be incubating, no opportunity was afforded to get a complete count of Golden Eagle pairs that attempted to build nests and reproduce but failed. Therefore, the number of active territorial pairs of Golden Eagles in the survey area could be higher than those actually identified (WRI, 2011)."*

O7-09

Additionally, in a year long survey the Document reports "low use" of the Project Site by Golden Eagles citing *"Golden Eagle observations at the proposed OWEF site were low over the nearly 2 years of raptor migration counts (0.01 observation/hr during fall 2009 migration counts, none during spring 2010 migration counts, and 0.02 observation/hr during fall 2010 migration counts)."* The use of observation/hr statistics with results lower than one imply a low rate, especially when compared to other observation/hr statistics from sites in other parts of California with more abundant Golden Eagle populations, or with other ecological factors that would account for higher numbers than those seen at the Project site in California's desert on the border of Mexico. Apples to apples and oranges to oranges would be a better comparison in comparing the use of the site by Golden Eagles to other sites in the Colorado and Sonoran deserts. Additionally, the document states *"Because Golden Eagle use of the proposed OWEF site is low (0.008 observations/ hour made over the three seasons of raptor counts), the collision risk is* *considered low."* This figure contradicts the use analysis discussed previously, and is misleading.

The Eagle Conservation Plan (ECP) prepared by the Project Proponent provided as an Appendix to the DEIR/DEIS, however, reports 36 Golden Eagle sightings in the yearlong study. This seems unlikely to qualify as "low use" of a wind project site in the Colorado and Sonoran desert of Southern California unless it can be shown that repeated sightings of the same individuals had occurred. Additionally, the ECP prepared by the Project Proponent reports that "25 of 36 eagle observations (were) within RSH (Rotor Swept Area) but overall numbers still very low." We submit that a statistic that shows that 70% of the observations of Golden Eagle are in the Rotor Swept Area of the turbines indicates a high probability of Golden Eagle mortality. **O7-10**

Also lacking in the analysis of the impacts of the project on Golden Eagles is the lack of analysis of the impacts of the project on sub-adult Golden Eagles using the site. Research in the Altamont Pass has shown that sub-adult Golden Eagles are particularly prone to collision with wind turbines. 63% of the collisions with turbines by Golden Eagles in the Altamont Pass were sub-adult Golden Eagles. (Dr. Grainger Hunt, ***Golden Eagles In A Perilous Landscape: Predicting The Effects Of Mitigation For Wind Turbine Blade-Strike Mortality, CEC, July 2002)***. The Document fails to analyze the impacts of turbine collision on this important age group of Golden Eagles, and the ECP prepared by the Proponent analyzes age groups of only juveniles and adult Golden Eagles with no analysis of sub-adult Golden Eagles, which are more susceptible to turbine collision, nor the impacts of the loss of sub-adult Golden Eagles on regional populations, especially the population of Golden Eagles in the Colorado and Sonoran desert of Southern California. **O7-11**

The Document does report *"As described in the US Fish and Wildlife Service (USFWS) Draft Eagle Conservation Plan (ECP) Guidance dated January 2011 (USFWS, 2011b), the USFWS recommends that project proponents prepare an ECP to avoid, minimize, and mitigate project-related impacts to eagles to ensure no-net-loss to the Golden Eagle population. Pursuant to BLM Instructional Memorandum (IM) 2010-156, the BLM will request "concurrence" from the USFWS that the ECP meets specific requirements. Ocotillo Express LLC has prepared a draft ECP (OE, 2011)."*

We submit that while the ECP may be adequate for compliance with the Bald and Golden Eagle Protection Act, it may not be adequate for the purposes of NEPA and CEQA as the ECP does not mitigate the impacts of the project on Golden Eagle to less than significant, nor is it enforceable. **O7-12**

The ECP also states *"OE LLC plans to implement an intensive operational Golden Eagle monitoring and research program for the OWEF. The Golden Eagle monitoring and research program includes implementation of a state of art Merlin avian radar system, radar controlled video tracking system, telemetry on any eagles nesting within four miles of the OWEF (assuming successful capture), and a full time Golden Eagle biological monitor to observe any Golden Eagles flying within the OWEF and to curtail turbines when eagles are at risk of collision. OE LLC plans to keep a staff biologist on site during the day year-round to monitor the movements of eagles and other wildlife through the site for the first five years of operations."*

We applaud these voluntary measures and the development of this important technology, which promises to be a great leap forward in avoiding avian mortality at wind project sites. But we note that the ECP with this mitigation measure is not part of the CEQA/NEPA document as an enforceable mitigation measure, cannot be considered as binding, enforceable mitigation and does not reduce the impacts of the project on Golden Eagle including loss of foraging habitat, interference with breeding or nesting success, and collision with turbines to less than significant. We also note that monitoring and research is not mitigation, and does not reduce the significant impacts of collision with turbines to less than significant. For Golden Eagle, a fully protected species, avoidance is the only mitigation that will reduce the impacts of collision with turbines. If the avoidance program of detection and curtailment is embodied in the CEQA and NEPA document as an enforceable mitigation measure rather than a voluntary measure, then the program may reduce the impacts to less than significant. Because the technology is unproven, we recommend that the radar technology and biologist be committed to the life of the project rather than five years only. If the technology is successful in avoiding Golden Eagle mortality, it should continue on the site. **O7-13**

The ECP also states *"Due to the experimental nature of the radar and biological monitoring system, and some uncertainties in the likelihood of Golden Eagle mortality, some compensatory mitigation for retrofitting of lethal power poles will be provided. An initial commitment of funds necessary to retrofit lethal power poles to compensate for 1 Golden Eagle fatality a year for the first five years of operation will be provided prior to operations using the formulas provided in the Draft Eagle Conservation Plan Guidance. Assuming $1,500 cost per pole, OEC LLC will provide $30,000 for the purpose of retrofitting lethal power poles in the region for the first five years of operation. Based on the eagle fatality estimates from the first three years of monitoring, the compensatory mitigation for the life of the project will be determined."*

We are concerned about any approach that sets a price for an industry on mortality of a fully protected or endangered species. It is not the authority of a project proponent to decide what any animal is worth, especially fully protected or endangered animals that are managed by wildlife agencies on behalf of the public. Appropriate avoidance measures should be utilized first, mitigation measures to offset losses are considered when avoidance is not possible, and penalties for unauthorized take are decided in consultation with appropriate agencies and authorities of federal or state agencies. To decide that Golden Eagles are worth $6,000 per eagle in compensatory mitigation is a dangerous precedent that will be followed by other developers if embodied in this agreement, and may be illegal. And while $30,000 in compensatory mitigation to retrofit power poles may be found by USFWS to satisfy the "no net loss" standard of the Bald and Golden Eagle Protection Act, it does not reduce the significant impacts of mortality of Golden Eagle from collision with turbines to less than significant for the purposes of NEPA or CEQA. Nor can this compensatory mitigation continue for an unlimited number of authorized or unauthorized take. This is an unacceptable standard. We submit, again, that avoidance is the most appropriate mitigation measure for Golden Eagle by not installing turbines where Golden Eagles are at risk of collision, or to use radar to curtail turbines or sectors of turbines when this operation is found to be effective in avoiding mortality of Golden Eagle, which we hope is soon. **O7-14**

We have specific concerns about the impacts of the project on sub-adult Golden Eagles and on Eagles from nesting territories in the West Coyote Mountains. We have concerns about the 90 **O7-15** turbines that are within 5 miles of the Coyote Mountains West nests, especially since there are 9 nests. We have concerns that a less than three-mile buffer zone from the nearest turbine to the active nests in this area is inadequate. There are no documents from USFWS that indicate that this buffer zone is adequate, or that the buffer zone determined by Proponent in the ECP is an acceptable standard. O7-15 cont

BLM Instruction Memorandum No. 2010-156 requires that "*All projects must document and include as part of the administrative record any and all written correspondence from the FWS indicating whether or not the project, as proposed, is or is not likely to take Golden Eagles. Correspondence must also address whether or not the FWS considers the development of an APP an option for the project as proposed, or if an alternative project proposal should be considered.* ***This coordination must be completed as early in the process as possible and incorporated into the NEPA document for the project.*** *(Emphasis added). If USFWS considers an APP to be an option for the project, a letter of concurrence must be sought and received from the FWS that addresses the adequacy of the APP. The letter of concurrence should be included in the administrative record.*" An ECP is an APP, and concurrence from the USFWS is required but has not been provided. O7-16

b. Migratory Birds

Songbird collisions typically account for roughly three quarters of bird casualties at U.S. wind facilities (Erickson et al. 2001; Johnson et al. 2002) and result in spring and fall peaks of bird casualty rates at most wind facilities (Johnson et al. 2002; Erickson et al. 2004).

Most songbirds, waterfowl, shorebirds, herons, and egrets migrate at night (Kerlinger and Moore, 1989). Nocturnal migrants generally take off after sunset, ascend to their cruising altitude between 300 and 2,000 feet (90–610 meters), and return to land before sunrise (Kerlinger, 1995). For most of their flight, songbirds and other nocturnal migrants are above the reach of wind turbines, but they pass through the altitudinal range of wind turbines during ascents and descents and may also fly closer to the ground during inclement weather or when negotiating mountain passes (Able, 1970; Richardson, 2000).

These ascents and descents may occur before dawn or after sunset, so only on site radar detection can provide an adequate analysis of impacts of a project on nocturnal, migratory songbirds.

Project Proponent conducted radar studies from September 2010 through July 2011. This data and analysis is provided for public comment in the CEQA and NEPA documents. However, the analysis fails to compare the use of the site by migratory birds in the spring and fall to other sites in the Colorado and Sonoran desert of Southern California, or of any other desert region in California. This analysis would be necessary in order determine if the impacts of the project on migratory birds is significant and unavoidable, and to determine mitigation to reduce those impacts to less than significant. On site radar studies using different technology were conducted at San Gorgonio Pass, another nearby site in the Southern California desert, in 1981 and 1982, and Southern California Edison conducted a followup study around 1986. The results of the radar studies at Ocotillo Express should be compared to the results of the radar studies at San Gorgonio Pass and Coachella Valley to analyze impacts. O7-17

The Document reports "Potential collision risk impacts to the other avian species listed above would be minimized though implementation of Mitigation Measures Wild-1p/Wild-1bb (*Develop and implement an Avian and Bat Protection Plan*), Wild-1dd (*Conduct post-construction bird and bat species mortality monitoring*), and Wild-1ee (*Prepare and implement a Wildlife Mortality Monitoring Program).*

However, if the ABPP does not contain avoidance measures, it does not reduce the impacts of the project on migratory birds to less than significant. The preparation of an ABPP and a monitoring program do not in and of themselves reduce mortality to less than significant, and monitoring is not mitigation. **O7-18**

Additionally, IM Instruction Memorandum No. 2010-156 requires that "*IM All projects must document and include as part of the administrative record any and all written correspondence from the FWS indicating whether or not the project, as proposed, is or is not likely to take Golden Eagles. Correspondence must also address whether or not the FWS considers the development of an APP an option for the project as proposed, or if an alternative project proposal should be considered.* ***This coordination must be completed as early in the process as possible and incorporated into the NEPA document for the project.*** *(Emphasis added). If USFWS considers an APP to be an option for the project, a letter of concurrence must be sought and received from the USFWS that addresses the adequacy of the APP. The letter of concurrence should be included in the administrative record."* **O7-19**

There are no documents or statements in the DEIR/DEIS regarding concurrence of USFWS or letter of adequacy in the NEPA documents for this project. **O7-20**

c. Burrowing Owl

Burrowing Owl is particularly susceptible to collision with wind turbines.

The Document states *"As noted in Section 3.23, three Burrowing Owls were observed during the Phase I habitat assessment (January 2010), two Burrowing Owl pairs were documented during the 2010 Phase III breeding season surveys (June/July 2010), and 20 Burrowing Owls were documented during the fall/winter 2010 surveys. Burrowing Owls were not observed migrating through the site during the 2009 or 2010 migration counts. The increased number of Burrowing Owls observed on the proposed OWEF site in fall are likely due in part to migrating owls from the northern United States other areas of Imperial County. Although they were not observed within the RSA, it is expected that the owls would fly within the RSA during migratory periods. Therefore, Burrowing Owl is at risk of collision with the turbines."*

Three Burrowing Owls were observed during the Phase I habitat assessment (January 2010), 2 Burrowing Owl pairs were documented during the 2010 Phase III breeding season surveys (June/July 2010), and 20 Burrowing Owls were documented during the fall/winter 2010 plant surveys.

We note that new guidance for Burrowing Owl may be released by California Department of Fish & Game (DFG) in the very near future and this guidance should be followed for mitigation for Burrowing Owl. O7-21

Burrowing Owl was considered for listing by DFG, but declined based in part upon the population stronghold in Imperial County. The Document should analyze the impacts of the project on the Imperial County status and distribution of Burrowing Owl, and the impacts on the population statewide. O7-22

3. Consistency determination with the Desert Renewable Energy Conservation Plan

DFG, California Energy Commission, USFWS and BLM have entered into an MOU to work together to create a Desert Renewable Energy Conservation Plan (DRECP) in the form of an NCCP/HCP on 24 million acres in the plan boundary. This boundary includes the project area. Even though the plan is not finalized, a consistency determination should be obtained from the DFG that the project is consistent with the conservation goals of the plan. O7-23

Thank you for the opportunity to comment.

Sincerely,

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James A. Peugh

James A. Peugh
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Defenders of Wildlife

Natural Resources Defense Council

Sierra Club

October 6, 2011

Cedric Perry, Project Manager
California Desert District
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
(Via email to: cperry@blm.gov)

Re: Comments on Draft Environmental Impact Statement/Draft Environmental Impact Report for the Proposed Ocotillo Express Wind Energy Facility (CACA 51552/ CA-670-2010-032)

Dear Mr. Perry:

Thank you for the opportunity to provide comments on the Draft Environmental Impact Statement/Environmental Impact Report ("DEIS/DEIR") and Proposed Amendment to the California Desert Conservation Area ("CDCA") Plan for the proposed Ocotillo Express Wind Energy Project. These comments are submitted on behalf of Defenders of Wildlife ("Defenders"), the Natural Resources Defense Council ("NRDC") and the Sierra Club, all non-profit public interest conservation organizations with offices in California as well as elsewhere in this country.

Defenders has 1.1 million members and supporters nationally, including 67,000 in California. Defenders is dedicated to protecting all wild animals and plants in their natural communities. To this end, we employ science, public education and participation, media, legislative advocacy, litigation, and proactive on-the-ground solutions in order to impede the accelerating rate of extinction of species, associated loss of biological diversity, and habitat alteration and destruction.

NRDC has over 1.2 million members and online activists nationwide, more than 250,000 of whom live in California. NRDC uses law, science and the support of its members and activists to protect the planet's wildlife and wild places and to ensure a safe and healthy environment for all living things. NRDC has worked to protect wildlands and natural values on public lands and to promote pursuit of all cost effective energy efficiency measures and sustainable energy development for many years.

The Sierra Club is a national nonprofit organization of approximately 1.3 million members and supporters (approximately 250,000 of whom live in California) dedicated to exploring, enjoying, and protecting the wild places of the earth; to practicing and promoting the responsible use of the earth's ecosystems and resources; to educating and enlisting humanity to protect and restore the quality of the natural and human environment; and to using all lawful means to carry out these objectives. The Sierra Club's concerns encompass protecting our public lands, wildlife, air and water while at the same time rapidly increasing our use of renewable energy to reduce global warming.

As we transition toward a clean energy future, it is imperative for our future and the future of our wild places and wildlife that we strike a balance between addressing the near term impacts of large scale renewable energy developments with the long-term impacts of climate change on our biological diversity, fish and wildlife habitat and natural landscapes. To ensure that the proper balance is achieved, we need smart planning for renewable power generation and transmission that primarily avoids, and secondarily minimizes, adverse impacts on wildlife and wild lands. These projects should be placed in the least harmful locations near existing transmission lines and on already disturbed lands.

We strongly support the emission reduction goals found in the Global Warming Solutions Act of 2006, AB 32, including the development of renewable energy in California. However, we urge that in seeking to meet our renewable energy portfolio standard in California, project proponents design their projects in the most sustainable manner possible. This is essential to ensure that project approval moves forward expeditiously and in a manner that does not sacrifice our fragile desert landscape and wildlife in the rush to meet our renewable energy goals.

Brief description of the proposed project

The proposed project entails the construction, operation and decommissioning of a wind energy facility consisting of 155 wind turbine generators capable of producing up to 465 MW, and associated access roads, construction areas, gen-tie to the Sunrise Powerlink and administrative facilities. It would be located within a 12,436 acre area comprised of public lands administered by the Bureau of Land Management (BLM) located in the western Imperial Valley near the town of Ocotillo, CA. The proposed project would be constructed in two phases; Phase I would consist of 137 wind turbines with a generating capacity of 315 MW, and Phase II would consist of an additional 18 wind turbines with a generating capacity of 150 MW. Phase I would be constructed within the Northwestern Site comprised of 11,269 acres and Phase II would be constructed within the Southeastern Site comprised of 1,167 acres.

Our specific comments are as follows:

1. Introduction. Our organizations recognize the need to develop our nation's renewable energy resources and to do so rapidly in order to respond effectively to the challenge of climate change. Unique natural resources here in California are already being affected by climate change, including, for example, Pikas in the High Sierra Nevada and Joshua Trees in the Mojave Desert.

We also recognize that renewable energy development can help create jobs in communities that are eager for them due to the current economic situation. For these and other related reasons, our organizations are working with regulators and project proponents to move properly sited renewable energy projects forward. That said, renewable development is not appropriate everywhere on the public lands and must be balanced against the equally urgent need to protect unique and sensitive resources of the CDCA. California is fortunate in having sufficient renewable resources in many areas of the State, which provide opportunities for development of renewable energy generation and transmission in an environmentally and economically sound manner.

We strongly support renewable energy production and utilization, but we do not consider the construction of large-scale projects proposed on relatively undisturbed public lands in the CDCA to be the only way, or even the best way, to achieve our renewable energy goals. We believe such large scale projects should be located on degraded or disturbed land such as abandoned agricultural fields, industrial sites, and near existing structures as much as possible before public lands containing relatively intact and ecologically significant biological communities are considered.

As we and our colleagues at sister organizations have repeatedly stated, the best way to develop the renewable resources of the CDCA is through comprehensive, pro-active planning by federal, state and local agencies to identify the most appropriate areas for such development -- *i.e.*, development zones -- and to guide development to those zones. *See, e.g.,* letter dated June 29, 2009 to Interior Secretary Salazar and California's Governor Schwarzenegger and signed by 11 organizations, including our own, attached to this letter. The Desert Renewable Energy Conservation Plan (DRECP) currently under development will provide the most appropriate pathway forward in achieving environmentally responsible renewable energy development opportunities through a zone-based strategy. The DRECP planning area includes the lands proposed for development of the Ocotillo Express wind project, but at this time we do not know whether or not they will be considered as suitable for renewable energy development or allocated for conservation of biological resources. Thus, it is critical that the state and federal planning agencies exercise their interim review authorities for this proposed project to determine whether or not it is consistent with the goals and objectives of the DRECP. O8-01

Despite our fundamental belief in the critical importance of agency-guided development of renewable energy, rather than developer-initiated development, we invested a great deal of time and effort into the "fast-track" projects last year, and will engage on individual projects, such as this one, in 2011.

The very first lesson that our organizations learned in the course of dealing with the "fast-track" projects in 2009-2010 is that the more time and money invested in an application by the BLM and the project proponent, the harder it is to make changes to a proposed project, even when those changes would significantly reduce natural and cultural resource conflicts. This lesson is a major reason why our groups pressed BLM and the Interior Department to adopt criteria for use in identifying which projects should be moved forward in the pending application queue. It was approximately six months ago that BLM adopted such criteria, *see* Instruction Memorandum No. 2011-061, "To: All Field Offices, From: Director, Subject: Solar and Wind Energy Applications – Pre-Application and Screening," dated February 7, 2011, and the BLM should be using those criteria in selecting which project applications will be processed and analyzed, i.e., to identify the projects which would be located in areas with the fewest environmental concerns, thus increasing the likelihood they can ultimately be approved in a timely manner and with the least amount of controversy. Based on our reading of the BLM's criteria, this approach – which would benefit both the public and the project proponents – does not appear to have been fully applied in the case of this application. **O8-02**

2. National Environmental Policy Act (NEPA). Based on our recent experience in analyzing and commenting on many NEPA documents for fast-track renewable energy projects in the California Desert and Nevada, which were published by the BLM, we strongly recommend that BLM pay particular attention to developing accurate and factual sections of the NEPA document for the proposed project for 1) purpose and need, 2) alternatives to the proposed action and 3) cumulative impacts.

   A. Purpose and need. The purpose and need statement should not simply indicate that BLM is responding to an applicant's right of way application, as it has done for this and other renewable energy projects. The purpose and need should also clearly and concisely explain how the proposed use of public lands supports public needs within the framework of laws, regulations and policies governing the use and management of these lands. We also note the purpose and need of the Department of Energy and the U.S. Army Corps of Engineers is included in the DEIR/DEIS. **O8-03**

   B. Alternatives to the proposed action. Alternatives are extremely important considering that public land-based renewable energy projects in the CDCA, individually and cumulatively, have resulted in the allocation of tens of thousands of acres of ecologically healthy public lands to single-use, utility scale energy projects in just the past year.

   The range of alternatives must be carefully and methodically developed as a means to primarily avoid, and secondarily to minimize, adverse impacts to natural and cultural resources on our public lands, and especially in the CDCA because of statutory management requirements contained in the Federal Land Policy and Management Act. Alternatives to the proposed project, including alternative locations and reduced project sizes, need to be fully considered and analyzed. Furthermore, alternative locations must not be limited to public lands; private lands may provide opportunities for project development that do not entail significant adverse impacts to natural biological communities and sensitive biological resources that are typically found on public lands. Consideration and analysis of alternative **O8-04**

O8-04 cont

project locations is critical to ensuring that sites ultimately approved for the proposed project is in the best possible location, and one that avoids as, much as practicable, destruction of natural biological communities.

NEPA requires that BLM consider a range of alternatives, which is "the heart of the environmental impact statement." 40 C.F.R. § 1502.14. NEPA requires BLM to "rigorously explore and objectively evaluate" a range of alternatives to proposed federal actions. See id. §§ 1502.14(a) and 1508.25(c). "An agency must look at every reasonable alternative, with the range dictated by the nature and scope of the proposed action."[1] An agency violates NEPA by failing to "rigorously explore and objectively evaluate all reasonable alternatives" to the proposed action.[2] This evaluation extends to considering more environmentally protective alternatives and mitigation measures.[3] NEPA requires that an actual "range" of alternatives is considered, so that they will "preclude agencies from defining the objectives of their actions in terms so unreasonably narrow that they can be accomplished by only one alternative (i.e. the applicant's proposed project)."[4] This requirement prevents the EIS from becoming "a foreordained formality."[5] A range of alternatives to the proposed project must also be evaluated under Section 15126.6 of CEQA.

O8-05

Many project applicants have signed Power Purchase Agreements with public utility companies for a certain amount of electrical power prior to decisions made by the land management agencies. This practice appears to have made some applicants and the BLM unwilling to consider alternatives to proposed projects, including possible re-configurations of project footprints and associated changes in energy production, that would clearly allow BLM to conform to its statutory and regulatory standards for management of public lands for biological resources. This perceived lack of flexibility cannot be allowed to preclude the BLM's consideration of a reasonable range of alternatives. The BLM must consider more alternatives than merely the project as proposed or no project. More specifically, the BLM should consider additional alternatives to the proposed project specifically designed to address unresolved resource conflicts and concerns, as detailed elsewhere in this letter.

O8-06

Although the DEIS includes two alternatives for smaller project size, they do not appear to have been designed to primarily avoid and secondarily to minimize adverse impacts on at-risk biological resources in a comprehensive manner. Both smaller project alternatives were influenced by the project applicant's stated objective – to develop a project that produces a minimum of 315 MW of power, which is consistent with their reported Power Purchase Agreement. This approach precludes consideration of other reasonable alternatives which would afford a greater degree of protection of at-risk biological resources. **O8-06 cont**

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[1] Northwest Envtl Defense Center v. Bonneville Power Admin., 117 F.3d 1520, 1538 (9th Cir. 1997).

[2] City of Tenakee Springs v. Clough, 915 F.2d 1308, 1310 (9th Cir. 1990) (quoting 40 C.F.R. § 1502.14).

[3] *See, e.g.,* Kootenai Tribe of Idaho v. Veneman, 313 F.3d 1094,1122-1123 (9th Cir. 2002) (and cases cited therein).

[4] Colorado Environmental Coalition v. Dombeck, 185 F.3d 1162, 1174 (10th Cir. 1999), citing Simmons v. United States Army Corps of Engineers, 120 F.3d 664, 669 (7th Cir. 1997).

[5] City of New York v. Department of Transp., 715 F.2d 732, 743 (2nd Cir. 1983). *See also,* Davis v. Mineta, 302 F.3d 1104 (10th Cir. 2002).

Furthermore, since BLM intends to determine whether or not to amend the CDCA Plan to allow for the proposed project, we strongly recommend that the alternatives include provisions for conserving at-risk species, such as the Flat-tailed horned Lizard, Golden eagle and Peninsular bighorn sheep, which would allow BLM to address, in part, its obligation under Section 7(a)(1) of the Endangered Species Act and its Special Status Species Management Policy contained in BLM Manual 6840. Such alternatives should consider conservation actions recommended by the FWS in biological opinions for other large-scale projects in this planning area that were determined to adversely affect Peninsular bighorn sheep, and in the recovery plan for this species, addressed elsewhere in this letter. Additional alternatives designed to conform to these management responsibilities are further justified because the proposed project is located on lands classified by BLM for Limited Use. Limited Multiple-Use Class protects sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished. *See* CDCA Plan, p. 13. **O8-07**

3. Species and Habitats of Special Concern and Project Modification Recommendations

A. Flat-tailed horned lizard. This BLM-designated Sensitive species occurs in an areas located in the northeast portion of the proposed project area. Impact mitigation measures are proposed including limiting construction to periods when the species in active so they can be detected and avoided, or trapped and relocated to non-construction areas. Although these measures are reasonable in attempting to minimize the loss of individuals, we consider Alternative 3 (105 WTG, 315 MW) the most effective means of avoiding habitat loss for this species. We are pleased BLM has incorporated this alternative into the DEIS. Alternative 3 reflects the greatest level of conformance with BLM management policy for Special Status Species. **O8-08**

B. Golden Eagle, Red-tailed hawk and other protected birds. Avian studies for this proposed project area included three seasons of on-site observations and reporting that identified resident and migratory species, which allowed for identification of potential effects of the proposed project on Special Status Species (e.g., Golden eagle, Burrowing owl, Swainson's hawk) and other species protected under the Migratory Bird Treaty Act. The most frequently observed protected birds on the project site were Turkey vulture and Red-tailed hawk. These species are protected under the Migratory Bird Treaty Act and potential adverse impacts to them should be addressed in an avian protection plan, with the goal of **O8-09** applying effective and timely measures to primarily avoid, and secondarily minimize, mortality due to turbine blade strikes. Our comments on birds emphasize Golden eagles in the following paragraphs. **O8-09 cont**

The DEIS concludes that Golden eagle occurrence in the project study area and overall risks to this fully protected species is low compared to other wind farm project areas. This conclusion does not take into consideration that Golden eagle occurrence and nesting territory density throughout the desert region is relatively low due to environmental factors such as prey density, rainfall variability and primary productivity of the habitat. The FEIS needs to more accurately describe the Golden eagle resource in the study area for this proposed project relative to its occurrence in the California desert or other similar arid regions. Such a description also needs to take into consideration the fact that the Golden eagle survey for the proposed project was done during a period of drought and that it didn't include both early and late season surveys as recommended by the USFWS, which, according to the DEIS, could result in underestimating actual and potential Golden eagle activity. **O8-10**

The DEIS concludes that with the application of mitigation measures that would be derived from a future Golden eagle protection plan, the overall impacts to this species would be less than significant. This is highly speculative and uncertain given that such plans typically call for monitoring of mortality and development of yet unspecified measures intended to effectively reduce or eliminate mortality through an adaptive management process. The FEIS should include a Golden eagle protection plan that has undergone review and concurrence by the USFWS and CDFG as an effective and timely means of avoiding or minimizing the effects of the proposed project on Golden eagles, and that such a plan will ensure that there is no net loss of this species. **O8-11**

One of the voluntary mitigation measures proposed by the project applicant entails the stationing of a biologist on site for two years to observe, detect and, as necessary, take actions intended to avoid Golden eagle mortality due to turbine blade strikes by selectively shutting-down operational turbines until the threat of impact has ceased. This strategy would also entail the use of a specialized bird-identifying radar system combined with high resolution video cameras. We are encouraged that such an approach is being offered, but the effectiveness of the radar system in detecting Golden eagles, for example, is yet unknown and is undergoing testing. If this overall impact avoidance and minimization strategy is applied, we strongly recommend that after an initial two-year period, provisions for extending the on-site biologist for the life of the project are required in the event the agencies conclude it is necessary to achieve the Golden eagle conservation objectives for the project. **O8-12**

Golden eagle occurrence and flight locations within the proposed project area have not been provided, and the draft Eagle Conservation Plan for the proposed project indicates that 25 out of 36 Golden eagle observations in the project area were within the rotor sweep area. These observations were made over a one-year period, and the DEIS indicates the overall use by Golden eagles is low, and therefore the mortality risk is also low. We believe the Golden eagle occurrence rate within the rotor sweep area indicates that mortality risk would be relatively high. Furthermore, we believe the analysis of mortality risk and rate needs to be extrapolated for the life of the project and not limited to a one-year timeframe. O8-13

Golden eagle occurrence and flight path information should be used in developing additional alternative or additional measures that would increase the potential for avoiding turbine placement in foraging and migratory flight pathways. This information should be combined with nest-site buffer zones so that an alternative that primarily avoids, and secondarily minimizes, impacts of the project on Golden eagles can be developed and considered. This is especially important because of the statutory protection afforded to Golden eagles, its designation as a Sensitive Species by BLM in California, and Limited Multiple Use Classification of the public lands that would be affected by the proposed project. O8-14

C. Peninsular bighorn sheep. The DEIS indicates there has been no recent Peninsular bighorn sheep use within the proposed project area, and that several individuals have been sighted within the I-8 Island adjacent to the proposed project boundary and very near to the I-8 Freeway that has considerable vehicular traffic. The term "recent" was not defined. Absent from the DEIS is information on Bighorn sheep use within the project area that is other than "recent." We raise this deficiency because there are proposed access roads and wind turbines proposed within areas identified as Essential Habitat by the USFWS[6]. Essential Habitats are those areas considered necessary for maintaining self-sustaining populations and a high probability for recovery of the species (Recovery Plan, p. 70). O8-15

The DEIS provides no information on the use of these areas by Bighorn and their importance in providing sources of forage and opportunities for movement, or their role in conservation of this endangered species. The analysis also does not adequately address the potential for wind turbine construction, operation and maintenance to adversely affect Bighorn by displacing them from Essential Habitat areas. The Recovery Plan indicates these animals move onto the valley floor in the southern portion of their range in California, and that they generally remain near rugged escape terrain. Human developments have also affected their intermountain movements. O8-16

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[6] U.S. Fish and Wildlife Service. 2000. Recovery plan for the bighorn sheep in the Peninsular Ranges, California. U.S. Fish and Wildlife Service, Portland, OR. 251 pp.

The USFWS recently completed a status review of the Peninsular bighorn sheep and addressed the new threats posed by renewable energy development on the desert floor within western Imperial County, with the potential that they may contribute to curtailment of movements between the Coyote Mountains to the north and the Jacumba Mountains to the south. We strongly recommend that BLM revise the impact analysis for this species and consider the information presented in the 5-year status review by the USFWS[7], and specifically pages 35-36. **O8-17**

We recommend that BLM develop another alternative that reflects a commitment to conservation of this species by, *inter alia*, eliminating access roads and wind turbines from Essential Habitat. **O8-18**

This concludes our comments on the proposed Ocotillo Express Wind Energy Facility. We hope our comments are helpful to BLM and Imperial County in developing the FEIS/FEIR. Thank you for the opportunity to review the DEIS/DEIR and provide comments.

Sincerely,

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Defenders of Wildlife
46600 Old State Highway, Unit 13
Gualala, CA 95445

Barbara Boyle

Barbara Boyle
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[7] U.S. Fish and Wildlife Service. 2011. Peninsular bighorn sheep (*Ovis canadensis nelsoni*) 5-Year Review: Summary and Evaluation. Carlsbad Fish and Wildlife Office, Carlsbad, CA. 95 pp.

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Audubon California
California Native Plant Society * California Wilderness Coalition
Center for Biological Diversity * Defenders of Wildlife
Desert Protective Council * Mojave Desert Land Trust
National Parks Conservation Association
Natural Resources Defense Council * Sierra Club * The Nature Conservancy
The Wilderness Society * The Wildlands Conservancy

Renewable Siting Criteria for California Desert Conservation Area

Environmental stakeholders have been asked by land management agencies, elected officials, other decision-makers, and renewable energy proponents to provide criteria for use in identifying potential renewable energy sites in the California Desert Conservation Area (CDCA). Large parts of the California desert ecosystem have survived despite pressures from mining, grazing, ORV, real estate development and military uses over the last century. Now, utility scale renewable energy development presents the challenge of new land consumptive activities on a potentially unprecedented scale. Without careful planning, the surviving desert ecosystems may be further fragmented, degraded and lost.

The criteria below primarily address the siting of solar energy projects and would need to be further refined to address factors that are specific to the siting of wind and geothermal facilities. While the criteria listed below are not ranked, they are intended to inform planning processes and were designed to provide ecosystem level protection to the CDCA (including public, private and military lands) by giving preference to disturbed lands, steering development away from lands with high environmental values, and avoiding the deserts' undeveloped cores. They were developed with input from field scientists, land managers, and conservation professionals and fall into two categories: 1) areas to prioritize for siting and 2) high conflict areas. The criteria are intended to guide solar development to areas with comparatively low potential for conflict and controversy in an effort to help California meet its ambitious renewable energy goals in a timely manner.

Areas to Prioritize for Siting

- Lands that have been mechanically disturbed, i.e., locations that are degraded and disturbed by mechanical disturbance:
  - Lands that have been "type-converted" from native vegetation through plowing, bulldozing or other mechanical impact often in support of agriculture or other land cover change activities (mining, clearance for development, heavy off-road vehicle use).[1]
- Public lands of comparatively low resource value located adjacent to degraded and impacted private lands on the fringes of the CDCA:[2]
  - Allow for the expansion of renewable energy development onto private lands.
  - Private lands development offers tax benefits to local government.
- Brownfields:
  - Revitalize idle or underutilized industrialized sites.
  - Existing transmission capacity and infrastructure are typically in place.

- Locations adjacent to urbanized areas:[3]
  - Provide jobs for local residents often in underserved communities;
  - Minimize growth-inducing impacts;
  - Provide homes and services for the workforce that will be required at new energy facilities;
  - Minimize workforce commute and associated greenhouse gas emissions.
- Locations that minimize the need to build new roads.
- Locations that could be served by existing substations.
- Areas proximate to sources of municipal wastewater for use in cleaning.
- Locations proximate to load centers.
- Locations adjacent to federally designated corridors with existing major transmission lines.[4]

High Conflict Areas
In an effort to flag areas that will generate significant controversy the environmental community has developed the following list of criteria for areas to avoid in siting renewable projects. These criteria are fairly broad. They are intended to minimize resource conflicts and thereby help California meet its ambitious renewable goals. The criteria are not intended to serve as a substitute for project specific review. They do not include the categories of lands within the California desert that are off limits to all development by statute or policy.[5]

- Locations that support sensitive biological resources, including: federally designated and proposed critical habitat; significant[6] populations of federal or state threatened and endangered species,[7] significant populations of sensitive, rare and special status species,[8] and rare or unique plant communities.[9]
- Areas of Critical Environmental Concern, Wildlife Habitat Management Areas, proposed HCP and NCCP Conservation Reserves.[10]
- Lands purchased for conservation including those conveyed to the BLM.[11]
- Landscape-level biological linkage areas required for the continued functioning of biological and ecological processes.[12]
- Proposed Wilderness Areas, proposed National Monuments, and Citizens' Wilderness Inventory Areas.[13]
- Wetlands and riparian areas, including the upland habitat and groundwater resources required to protect the integrity of seeps, springs, streams or wetlands.[14]
- National Historic Register eligible sites and other known cultural resources.
- Locations directly adjacent to National or State Park units.[15]

EXPLANATIONS

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[1] Some of these lands may be currently abandoned from those prior activities, allowing some natural vegetation to be sparsely re-established. However, because the desert is slow to heal, these lands do not support the high level of ecological functioning that undisturbed natural lands do.

[2] Based on currently available data.

[3] Urbanized areas include desert communities that welcome local industrial development but do not include communities that are dependent on tourism for their economic survival.

[4] The term "federally designated corridors" does not include contingent corridors.

[5] Lands where development is prohibited by statute or policy include but are not limited to:

National Park Service units; designated Wilderness Areas; Wilderness Study Areas; BLM National Conservation Areas; National Recreation Areas; National Monuments; private preserves and reserves; Inventoried Roadless Areas on USFS lands; National Historic and National Scenic Trails; National Wild, Scenic and Recreational Rivers; HCP and NCCP lands precluded from development; conservation mitigation banks under conservation easements approved by the state Department of Fish and Game, U.S. Fish and Wildlife Service or Army Corps of Engineers a; California State Wetlands; California State Parks; Department of Fish and Game Wildlife Areas and Ecological Reserves; National Historic Register sites.

[6] Determining "significance" requires consideration of factors that include population size and characteristics, linkage, and feasibility of mitigation.

[7] Some listed species have no designated critical habitat or occupy habitat outside of designated critical habitat. Locations with significant occurrences of federal or state threatened and endangered species should be avoided even if these locations are outside of designated critical habitat or conservation areas in order to minimize take and provide connectivity between critical habitat units.

[8] Significant populations/occurrences of sensitive, rare and special status species including CNPS list 1B and list 2 plants, and federal or state agency species of concern.

[9] Rare plant communities/assemblages include those defined by the California Native Plant Society's Rare Plant Communities Initiative and by federal, state and county agencies.

[10] ACECs include Desert Tortoise Desert Wildlife Management Areas (DWMAs). The CDCA Plan has designated specific Wildlife Habitat Management Areas (HMAs) to conserve habitat for species such as the Mohave ground squirrel and bighorn sheep. Some of these designated areas are subject to development caps which apply to renewable energy projects (as well as other activities).

[11] These lands include compensation lands purchased for mitigation by other parties and transferred to the BLM and compensation lands purchased directly by the BLM.

[12] Landscape-level linkages provide connectivity between species populations, wildlife movement corridors, ecological process corridors (e.g., sand movement corridors), and climate change adaptation corridors. They also provide connections between protected ecological reserves such as National Park units and Wilderness Areas. The long-term viability of existing populations within such reserves may be dependent upon habitat, populations or processes that extend outside of their boundaries. While it is possible to describe current wildlife movement corridors, the problem of forecasting the future locations of such corridors is confounded by the lack of certainty inherent in global climate change. Hence the need to maintain broad, landscape-level connections. To maintain ecological functions and natural history values inherent in parks, wilderness and other biological reserves, trans-boundary ecological processes must be identified and protected. Specific and cumulative impacts that may threaten vital corridors and trans-boundary processes should be avoided.

[13] Proposed Wilderness Areas: lands proposed by a member of Congress to be set aside to preserve wilderness values. The proposal must be: 1) introduced as legislation, or 2) announced by a member of Congress with publicly available maps. Proposed National Monuments: areas proposed by the President or a member of Congress to protect objects of historic or scientific interest. The proposal must be: 1) introduced as legislation or 2) announced by a member of Congress with publicly available maps. Citizens' Wilderness Inventory Areas: lands that have been inventoried by citizens groups, conservationists, and agencies and found to have defined "wilderness characteristics." The proposal has been publicly announced.

[14] The extent of upland habitat that needs to be protected is sensitive to site-specific resources. For example: the NECO Amendment to the CDCA Plan protects streams within a 5-mile radius of Townsend big-eared bat maternity roosts; aquatic and riparian species may be highly sensitive to changes in groundwater levels.

[15] Adjacent: lying contiguous, adjoining or within 2 miles of park or state boundaries. (Note: lands more than 2 miles from a park boundary should be evaluated for importance from a landscape-level linkage perspective, as further defined in footnote 12).

Imperial
Chamber of Commerce

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October 4, 2011

Ocotillo Wind Energy Facility DEIS/DEIR Comments
c/o Cedric Perry, Project Manager
Bureau of Land Management
California Desert District Office
22 & 35 Calle San Juan de Los Lagos
Moreno Valley, Ca. 92553

Dear Cedric Perry:

The Imperial Chamber of Commerce supports Pattern Energy's proposed Ocotillo Wind Project. We endorse the Ocotillo Wind Project because it will increase local business and produce clean energy for California.

Pattern is a leader in the renewable energy industry with a reputation for using innovative mitigation measures to protect the environment and wildlife. The Ocotillo Wind Project will be an economic stimulus for the region and produce clean energy equal to the needs of 140,000 homes. The project would create up to 300 jobs during construction and up to 30 during operation, provide business for local contractors, and contribute significantly to local tax revenues.

O9-01

Pattern has proven they are committed to the communities near their projects by providing funding for local programs and sponsoring events important to our communities. Pattern donated to the Imperial Valley School District to keep Westside Elementary school open, restart the IV Food Bank's school back pack program at Westside Elementary, and contributed to the IV Desert Museum to complete their lab and to the Ocotillo Optimists for their graduate school program and a fence around the basketball court at the Ocotillo Community Park. Pattern has pledged to contribute further to local programs through the Ocotillo Wind Project.

The Imperial Chamber of Commerce believes the permit application for the Ocotillo Wind Project is thorough and addresses concerns raised during the scoping process. We endorse Pattern's Ocotillo Wind Project because it will bring economic, environmental and community benefits to the Imperial Valley.

Sincerely,

Sharon Ryan

Sharon Ryan, CEO
Imperial Chamber of Commerce

CALIFORNIA
STATE PARKS
FOUNDATION

October 6, 2011

Mr. Cedric Perry
Bureau of Land Management, El Centro Field Office
22835 Calle San Juan De Los Lagos
Moreno Valley, CA, 92553

SENT VIA ELECTRONIC MAIL

RE: Draft Environmental Impact Report/Draft Environmental Impact Statement for Ocotillo Wind Energy Facility, Case File Number: CACA051552

Dear Mr. Perry,

On behalf of the California State Parks Foundation ("CSPF") and its 120,000 members statewide, I appreciate the opportunity to comment on the proposed Draft Environmental Impact Report/Draft Environmental Impact Statement ("DEIS/EIS") for the Ocotillo Wind Energy Facility ("Project").

CSPF is the only statewide, independent nonprofit organization dedicated to protecting, enhancing and advocating for California's magnificent state parks. Over the last several years, we have provided leadership on statewide efforts to protect state parks from incompatible developments that impact and threaten public access, visitor enjoyment and the economic vitality of California's 278 state parks. In addition to pursing state legislation, we have been integrally involved in regional and local campaigns to protect state parks from transportation, utility, and commercial developments that were wholly incompatible with the recreational, natural and cultural resources goals of the affected state parks. **O10-01**

CSPF's interest in this Project is related to its impacts to Anza-Borrego Desert State Park ("ABDSP"). ABDSP is a unique state treasure that supports over 400,000 acres of designated State Wilderness areas, representing over 80% of all lands so designated in California. ABDSP was designated in 1974 as a National Natural Landmark. In 1985, the park was named a member of the International Biosphere Reserve Program by the United Nations in recognition of its stature as an internationally significant conservation area (ABDSP General Plan, 2005). It is the largest state park in California and the continental United States, with over 600,000 acres of pristine desert and mountain wilderness, hiking trails, and unparalleled vistas. **O10-02**

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Your Voice for Parks

In Fiscal Year 2009-10, almost 500,000 people visited ABDSP, generating $486,000 from user and concession fees. Visitors to ABDSP travel to the park to experience a unique park experience that can be best characterized in ABDSP's vision statement, included in its 2005 General Plan:

> ABDSP is a place of awe, inspiration, and refuge. The vast desert landscape and scenery are preserved in a pristine condition. The full array of natural and cultural resources are cared for so as to perpetuate them for all time while supporting those seeking enjoyment from these resources…Emphasis is placed on having park visitors experience the true, real, tangible desert environment…(ABDSP General Plan, p. 3-8)

CSPF is concerned with significant impacts to ABDSP from the proposed Project that will lead to changes to the visual character at ABDSP and degradation of the natural environment. We are also concerned with cumulative impacts to ABDSP from numerous renewable energy proposals in the area surrounding the park that are currently under review.

O10-02 cont

Degradation of the visitor experience from changes to visual character at ABDSP
The proposed Project is directly adjacent to the southeastern corner of ABDSP and would be visible from within the park. As acknowledged by the DEIR/EIS, the project would result in, "the introduction of visually prominent built structures into a landscape generally lacking similar built features of industrial or technological character" (DEIR/EIS, p. 4.18-7). Further, the DEIR/EIS notes that the impacts will significant and unavoidable and the proposed Project would be inconsistent with ABDSP management plan.

Key observations points ("KOP") observed at the park include KOP 5 and KOP 6, both providing panoramic vista views. Both areas are currently locations in the park where visitors are attracted to the area for the backcountry, natural and solitude desert experience. The introduction of up to 152 large scale wind turbines creates obvious and disruptive change to the character of the southern corner of the park.

O10-03

Degradation of the Natural Environment
We support comments made by the California Department of Parks and Recreation regarding specific impacts to sensitive federally-listed and state-listed species that reside in, or utilize habitat corridors located within ABDSP. Additionally, we are concerned that the Project may

O10-04

disrupt or interrupt critical habitat for the federally-endangered and state-threatened bighorn sheep that are iconic and recognizable throughout ABDSP.

O10-04 cont

Cumulative Impacts from Renewable Energy Projects
Meeting the state's renewable energy objectives is an important goal, but one that should not be at odds with continued protection of the state's natural infrastructure. We are particularly concerned about the presence and progress of other wind and renewable energy projects adjacent to ABDSP and within close proximity of the proposed Project. Indeed, CEQA requires lead agencies to analyze and evaluate impacts across a range of proposed projects when those projects are known and their actions are reasonably foreseeable. Failure to review the totality of impacts from the multiple projects that seek to utilize a common project area is a violation of CEQA requirements. The current analysis does not adequately analyze the substantial cumulative impacts to ABDSP. We do not believe alternatives from this DEIR/EIS can be reasonably adopted or plans or permits issued by the approving agencies without specific identification of cumulative impacts from all pending projects that are proposed to this area. CSPF urges the recirculation of the DEIR/EIS, so that a full and complete environmental review of the cumulative impacts of this Project to ABDSP along with other pending projects can be conducted.

O10-05

Thank you for the opportunity to comment on the proposed Project. Please do not hesitate to contact me at 916-442-2119 with any questions regarding this letter or CSPF's position.

Sincerely,

Traci Verardo Torres

Traci Verardo-Torres Vice President, Government Affairs
California State Parks Foundation

CC: Gail Sevrens, California Department of Parks and Recreation
Conrad Kramer, Anza-Borrego Foundation

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11.156.01

October 6, 2011

VIA EMAIL AND U.S. MAIL

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Re: Comments of Desert Protective Council, The Protect Our Communities Foundation, Backcountry Against Dumps, East County Community Action Coalition and Donna Tisdale on the Draft Environmental Impact Statement/Draft Environmental Impact Report for Ocotillo Wind Energy Facility

Dear Officials:

Pursuant to the California Environmental Quality Act ("CEQA"), California Public Resources Code ("P.R.C.") section 21000 *et seq.*, and the National Environmental Policy Act ("NEPA"), 42 U.S.C. section 4321 *et seq.*, and in accordance with the public notices provided by the Bureau of Land Management ("BLM") and the County of Imperial ("County") (collectively "reviewing agencies"), Desert Protective Council, The Protect Our Communities Foundation, Backcountry Against Dumps, East County Community Action Coalition and Donna Tisdale (hereinafter "Conservation Groups") submit the following Comments on the reviewing agencies' joint Draft Environmental Impact Statement/Draft Environmental Impact Report ("DEIS") for the Ocotillo Wind Energy Facility ("Ocotillo Wind" or the "Project").

O11-01

At the outset, Conservation Groups wish to express their opposition to this Project as an unnecessary industrialization of pristine desert wildland areas. Echoing a growing chorus of opinions on this subject, Conservation Groups urge the reviewing agencies to analyze and adopt as an alternative to the proposed project the development of wide-spread non-fossil fuel distributed generation projects near demand centers in already-disturbed areas.[1] The reviewing agencies dismiss a

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[1] According to the California Public Utilities Commission ("CPUC"), distributed generation is electricity provided by "non-centralized electricity power production facilities less than 20 MW

"Distributed Solar Generation" alternative as being infeasible and unable to fulfill all the Project objectives, but as discussed below these conclusions are erroneous. Further, the reviewing agencies have not even considered a distributed generation alternative that includes more than just solar generation. The EIS must provide a robust analysis of distributed generation alternatives, including solar and other generation sources, that would obviate the need for the Project. In further expression of this major concern and others, Conservation Groups offer the following comments on the DEIS. O11-01 cont

I. Project Purpose and Need

NEPA requires EISs to "specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action." 40 C.F.R. § 1502.13. BLM must not "adopt[] private interests to draft a narrow purpose and need statement." *National Parks & Conservation Assn. v. U.S. Bureau of Land Mgmt* ("*NPCA v. BLM*"), 606 F.3d 1058, 1071 (9th Cir. 2010). The Department of the Interior's "NEPA handbook explains that the 'purpose and need statement for an externally generated action must describe the BLM purpose and need, *not an applicant's or external proponent's purpose and need.*'" *Id.* at 1071 n. 9 (emphasis in original). O11-02

Here, the DEIS states that BLM's purpose and need is merely to

> respond to a [Federal Land Policy Management Act ("FLPMA") right-of-way ("ROW")] application submitted by the Applicant to construct, operate, maintain, and decommission a wind energy-generating facility and associated infrastructure on public lands administered by the BLM in compliance with FLPMA, BLM ROW regulations, and other applicable Federal laws and policies.

DEIS 1-2. The only other BLM purpose and need information provided is a very brief summary of three "BLM authorities." DEIS 1-3. And even for those three "authorities," the DEIS provides no explanation of which goals are preeminent, what other BLM authorities affect the Project purpose and need, or *why* the Project is needed to comply with any of those authorities. This is entirely inadequate for NEPA purposes.

It is not enough for BLM to reiterate its statutory duty to review applications submitted to it and cursorily list three applicable "BLM authorities." BLM must actually "*specify* the "*underlying* purpose and need" for the Project itself. 40 C.F.R. section 1502.13 (emphasis added); *North Carolina Alliance for Transportation Reform v. Department of Transportation*, 151 F.Supp.2d 661, 688 (M.D.N.C. 2001); *Rankin v. Coleman*, 394 F.Supp. 647, 656-7 (E.D.N.C. 1975). This entails

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interconnected at the distribution side of the electricity system. [Distributed generation] technologies include solar, wind and water-powered energy systems; and renewable and fossil-fueled internal combustion (IC) engines, small gas turbines, micro-turbines and fuel cells." CPUC, "Impacts of Distributed Generation, Final Report," January 2010, p. 3-3, available at: http://www.cpuc.ca.gov/NR/rdonlyres/750FD78D-9E2B-4837-A81A-6146A994CD62/0/ImpactsofDistributedGenerationReport_2010.pdf/.

identifying which specific goals BLM is attempting to fulfill through the Project and demonstrating why the Project is needed to meet those goals. Without a more definitive statement of purpose and need, it is impossible for BLM and the public to identify a reasonable range of alternatives. *Highway J Citizens Group v. Mineta*, 349 F.3d 938, 960 (7th Cir. 2003) ("an agency is required to address three questions in considering alternatives .... First, what is the purpose of the proposed project (major federal action)? Second, given that purpose, what are the reasonable alternatives to the project?").

O11-02 cont

Furthermore, a preliminary analysis of the lone Project goal that appears consistently throughout the DEIS' description of BLM's, the County's and the Project applicant's objectives – development of environmentally sound energy to, *inter alia*, help achieve California, and San Diego Gas and Electric Company ("SDG&E") specifically,[2] achieve the state's Renewables Portfolio Standard ("RPS") – indicates that SDG&E should be able to meet its 33 percent renewable energy target by 2020 *without* the Project. The DEIS provides no evidence to the contrary.

SDG&E is on pace to add between 80 and 100 MW of distributed solar photovoltaic ("PV") capacity in its service territory each year from 2011 through 2020. This new PV generation will be developed under the auspices of programs such as the Renewable Auction Mechanism program, which the CPUC approved in December 2010.[3] Under that program, California will add 1,000 MW of local PV by 2015, 80.7 MW of which were allocated to SDG&E. SDG&E will also be allotted approximately 50 MW of local PV under the 750 MW SB 32 feed-in tariff distributed PV program.[4] Furthermore, by the end of 2016, approximately 180 MW of distributed PV capacity will be added in SDG&E's service territory under the California Solar Initiative "million solar roofs" program.[5] Combined, approximately 410 MW of local PV capacity will be developed in SDG&E's service territory by the end of 2015. And SDG&E has the ability to add much more, as its territory has at least 7,000 MW of urban and suburban PV potential.[6]

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[2] *See, e.g.*, DEIS 1-4 (one of the applicant's objectives is to "develop a source of renewable power that can be placed into service in an expeditious manner by interconnecting to San Diego Gas and Electric's (SDG&E) Sunrise Powerlink, 500-kv transmission line).

[3] CPUC Decision D.10-12-048, "Decision Adopting the Renewable Auction Mechanism," December 16, 2010, p. 30, Table 1, available at: http://docs.cpuc.ca.gov/word_pdf/FINAL_DECISION/128432.pdf.

[4] CPUC feed-in tariff website, description of SB 32, available at: http://www.cpuc.ca.gov/PUC/energy/Renewables/feedintariffssum.htm.

[5] California Center for Sustainable Energy, "Overview of Solar Incentive Programs," October 9, 2009, p. 7, available at: http://www.slideshare.net/ccsemedia/overview-ofsolar-incentive-programs.

[6] Powers, *San Diego Smart Energy 2020: The 21st Century Alternative*, October 2007, p. 48, available at:

In addition to distributed PV, SDG&E is also on pace to add a substantial number of distributed combined heat and power ("CHP") plants over the next decade. Biogas- or biomethane-fired CHP plants are renewable portfolio standard-eligible, and there are up to 1,700 MW of currently estimated biogas and/or biomethane potential in California to fuel those plants.[7] California's AB 32 greenhouse gas compliance strategy calls for the development of 4,000 MW of CHP by 2020.[8] Since SDG&E supplies about 7 percent of the state's electricity,[9] about 280 MW of new CHP should be allocated to and added in SDG&E's service territory by 2020 to comply with the AB 32 target.

Combined with its existing renewable energy generation capacity, the additional distributed PV and CHP capacity – and other distributed renewable energy generation capacity likely to be developed over the next decade – will allow SDG&E to meet its 33 percent renewable energy target by 2020 without the Ocotillo Wind Project. This is entirely consistent with California's current policy favoring the development of distributed renewable energy generation sources, as evinced by Governor Jerry Brown's Clean Energy Jobs Plan. Governor Brown's Plan sets a statewide target of deploying 12,000 MW of local renewable energy by 2020, with a preliminary allocation of 2,000 MW of this new generation to the San Diego region.[10]

O11-02 cont

II. Alternatives

NEPA requires that an EIS "[r]igorously explore and objectively evaluate all reasonable alternatives" so that "reviewers may evaluate their comparative merits." 42 U.S.C. §4332; 40 C.F.R. § 1502.14. Furthermore, "[a]n agency may not define the objectives of its action in terms so unreasonably narrow that only one alternative among the environmentally benign ones in the agency's power would accomplish the goals of the agency's action, and the EIS would become a foreordained

O11-03

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http://www.etechinternational.org/new_pdfs/smartenergy/52008_SmE2020_2nd.pdf.

[7] CEC PIER Program, Consultant Report, "Distributed Renewable Energy Assessment – Final Report," August 11, 2009, Appendix Bio-Power, p. 49, available at: http://www.cleancoalition.org/storage/references/11-aug-09_Navigant_distributed%20renewable%20energy%20assessment_final%20report.pdf.

[8] CPUC Decision D.10-12-035, "Decision Adopting Qualifying Facility and CHP Program Settlement Agreement," December 16, 2010, available at: http://docs.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/128624.PDF.

[9] CEC, "2007 Integrated Energy Policy Report, December 2007," p. 27, Figure 1-11, available at: http://www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CMF.PDF.

[10] *See* CEC, Transcript of Committee Workshop on Renewable Localized Generation, May 9, 2011, available at: http://www.energy.ca.gov/2011_energypolicy/documents/index.html#05092011.

formality." *NPCA v. BLM*, 606 F.3d at 1070 (internal quotations and citations omitted). "The existence of a viable but unexamined alternative renders an environmental impact statement inadequate." *Friends of Yosemite Valley v. Kempthorne*, 520 F.3d 1024, 1038 (9th Cir. 2008).

Similarly, to comply with CEQA, agencies must consider a "reasonable range" of alternatives. CEQA Guidelines §15126.6(a); *Village of Laguna Beach, Inc. v. Board of Supervisors* (1982) 134 Cal.App.3d 1022, 1028. A project *cannot* be approved if its significant impacts can be feasibly reduced to insignificance through project alternatives or mitigation measures. P.R.C §§ 21002, 21081.

Here, the reviewing agencies unacceptably eliminated feasible – not to mention less environmentally damaging and more economically beneficial – alternatives from careful review. Most notably, they dismissed the Distributed Solar Generation alternative and *entirely* failed to consider a distributed generation alternative that includes more than just solar generation. DEIS 2-39.

The DEIS describes the Distributed Solar Generation alternative as follows:

> A distributed solar alternative would consist of PV panels that would absorb solar radiation and convert it directly to electricity. The PV panels could be installed on building rooftops or in other disturbed areas such as parking lots or adjacent to existing substations.

O11-03 cont

DEIS 2-37. The DEIS dismisses the Distributed Solar Generation alternative on the grounds that it would (1) not meet technical or economic feasibility criteria, (2) only partially meet the objectives of achieving California's RPS through wind power generation, and (3) not meet the objective of developing wind power generation. DEIS 2-39. But the DEIS is wrong; distributed generation (both solar and not) is feasible, would meet the Project objectives *and* would provide additional environmental and economic benefits.

First, as discussed above, distributed solar and combined heat and power generation, among other sources, is not only technically and economically feasible, *it is already occurring*. SDG&E is on pace to add between 80 and 100 MW of distributed solar PV capacity alone in its service territory each year from 2011 through 2020. And there is potential for much more growth beyond that. For example, under the San Diego Smart Energy 2020 Plan developed by mechanical engineer Bill Powers, SDG&E could install either approximately 900 MW of local PV resources with an incentive budget of $700 million, or approximately 2,000 MW of local PV resources with an incentive budget of $1.5 billion.[11] Indeed, the distributed renewable generation is being developed at such a rate that SDG&E will be able to meet its 33 percent renewable energy target by 2020 without the Ocotillo Wind Project.

Second, while it is true that distributed PV and CHP generation would not meet the project applicant's objective of constructing a wind energy project, NEPA does not allow agencies to use such a narrow objective in determining which alternatives to fully analyze in an EIS. *NPCA v. BLM*, 606 F.3d at 1070. Using wind energy development as a criteria for winnowing Project alternatives unduly precludes analysis of *any other* type of energy generation, many of which, like distributed solar PV, have *fewer* environmental impacts than wind energy. Furthermore, the DEIS entirely fails to analyze the development of small-scale, distributed wind generation. The reviewing agencies should consider a distributed generation alternative that includes small-scale wind generation.

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[11] Powers, *San Diego Smart Energy 2020: The 21st Century Alternative*, October 2007.

Third, distributed generation projects often have environmental and economic advantages over industrial-scale wind projects and other generation sources. As former CPUC Commissioner John Bohn acknowledged, "[u]nlike other generation sources, [distributed generation] projects can get built quickly and without the need for expensive new transmission lines. And . . . these projects are extremely benign from an environmental standpoint, with neither land use, water, or air emission impacts."[12] Furthermore, according to the California Air Resources Board, solar PV creates nearly *three times* as many *permanent* jobs as wind per peak megawatt developed (1.52 jobs/MW versus 0.52 jobs/MW).[13] Thus, developing 465 MW of distributed solar PV would create approximately 707 permanent jobs, whilst the proposed 465-MW Ocotillo Wind Project would create just 242.

In sum, a distributed solar generation alternative is feasible, cost-effective, environmentally beneficial, and would meet the Project objectives. The reviewing agencies must thus fully examine this alternative. Further, the agencies should examine a distributed generation alternative that includes small-scale wind and CHP generation, along with other non-solar distributed generation sources.

O11-03 cont

III. Environmental Impacts

The EIS must take a "hard look" at the environmental impacts of proposed major federal actions and provide a "full and fair discussion" of those impacts. 40 C.F.R. § 1502.1; *see also National Parks & Conservation Ass'n v. Babbitt*, 241 F.3d 722, 733 (9th Cir. 2001). From a CEQA point of view, the EIR must inform the public and agency decisionmakers of all potentially significant environmental impacts prior to project approval. As the California Supreme Court has previously explained, "[t]he environmental impact report is the heart of CEQA and the environmental alarm bell whose purpose it is to alert the public and its responsible officials to environmental changes before they have reached ecological points of no return." *Sierra Club v. State Board of Forestry* (1994) 7 Cal.4th 1215, 1229 (quotations and citations omitted). Here, however, the DEIS' discussion of many environmental impacts is absent or inadequate, as explained below.

O11-04

A. Noise Impacts

O11-05

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[12] CPUC, "CPUC Approves Edison Solar Roof Program," Press Release, June 18, 2009, available at: http://docs.cpuc.ca.gov/published/News_release/102580.htm.

[13] California Air Resources Board, "Proposed Regulation for a California Renewable Electricity Standard," Staff Report: Initial Statement of Reasons, June 2010, Table X-11, p. X-19, available at: http://www.arb.ca.gov/regact/2010/res2010/res10isor.pdf.

One of the DEIS's most glaring inadequacies is its failure to adequately assess the impacts of infra- and low-frequency noise ("ILFN"). The DEIS not only fails to properly analyze the impacts of ILFN, it fails to even calculate or discussion how much ILFN the Project would produce. The Project is likely to produce enough ILFN to cause a significant adverse environmental impact, and the reviewing agencies' failure to identify, let alone analyze and mitigate, this impact flouts both CEQA and NEPA. The reviewing agencies have similarly contravened CEQA and NEPA by failing to accurately calculate and present the Project's audible noise impacts. **O11-05 cont**

Wind turbine noise expert Richard James has submitted to BLM and the County an extensive wind turbine noise impact review of the Project. Conservation Groups generally agree with, and therefore incorporate by reference, Richard James' October 6, 2011 review. Conservation Groups also provide the following discussion of wind turbine noise impacts.

1. ILFN Can Produce Significant Adverse Health and Environmental Impacts

O11-06

Health impacts from wind turbine noise can be severe. And as emerging research is consistently showing, the noise does not even have to be audible to cause substantial health impacts. As one researcher concluded, "non-aural physiological and psychological effects may be caused by levels of low frequency noise below the individual hearing threshold."[14] As another wind turbine noise research stated, "[t]here is no doubt that some humans exposed to infrasound experience abnormal ear, [central nervous system], and resource induced symptoms that are real and stressful."[15]

Health impacts from ILFN can include sleep disturbance, visceral vibratory vestibular disturbance, vertigo, headaches, dizziness, unsteadiness, tinnitus, ear pressure or pain, external auditory canal sensation, fatigue, irritability, memory and concentration effects, loss of motion, cardiac arrhythmias, stress and hypertension, among others.[16] "The energy generated by large turbines can be especially disturbing to the vestibular systems of some people, as well as cause other troubling sensations of the head, chest, or other parts of the body." Exhibit 2 at 24.

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[14] M. Schust, "Effects of low frequency noise up to 100 Hz," *Noise & Health*, 23(6):73-85, 2004, p. 73, available at: http://www.noiseandhealth.org/article.asp?issn=1463-1741;year=2004;volume=6;issue=23;spage=73;epage=85;aulast=Schust. *See also* Alec N. Salt & Timothy E. Hullar, "Responses of the ear to low frequency sounds, infrasound and wind turbines," *Hearing Research*, 268 (2010) 12-21 (attached hereto as Exhibit 1).

[15] Geoff Leventhal, "Review of Published Research on Low Frequency Noise and Its Effects," *prepared for* Defra (U.K. Department of Environment, Food and Rural Affairs), May 2003, p. 60, available at: http://www.defra.gov.uk/environment/quality/noise/research/lowfrequency/documents/lowfreqnoise.pdf.

[16] *See, e.g.*, Punch, Jerry, Richard James & Dan Pabst, 2010, "Wind-Turbine Noise: What Audiologists Should Know," *Audiology Today*, July/August 2010, pp. 20-31 (attached to these

Here, there are dozens of residences within 1.25 miles of the proposed turbines on the Ocotillo Wind Project site, including those in the communities of Ocotillo and Coyote Wells (*see* DEIS 3.2-5; DEIS figures 3.6-3b, 4.18-9B), a distance within which experts are increasingly finding wind turbine noise impacts, as discussed below. Thus, the impacts described above are likely to significantly and adversely impact Project area residents.

O11-06 cont

Without specifically mentioning ILFN, the DEIS provides a very cursory discussion of "Wind Turbine Syndrome" and concludes that there is not enough evidence to support "a dose-response relationship, and more research is needed to identify whether wind turbine noise and vibration may cause the reported symptoms." DEIS 4.11-13. However, the DEIS bases its conclusion on *only one* study (the aforementioned 2009 report by Nina Pierpont), which it dismisses as being a "small clinical case study [that] does not support a dose-response relationship." DEIS 3.12-6. This selective analysis of *just one* study stymies the informational goals of NEPA and CEQA and in no way constitutes a "hard look" at the Project's ILFN noise pollution impacts.

Furthermore, the reviewing agencies' failure to analyze, quantify or qualify the Project's ILFN impacts is not excused, as they assert, by the lack of "recognized regulatory guidance or thresholds related to [Wind Turbine Syndrome]." DEIS 4.11-13. Just because ILFN "is not yet [explicitly] recognized as a disease agent, is not covered by legislation" and "permissible exposure levels have not yet been established" does not mean the DEIS can *entirely* ignored this issue. *See Berkeley Keep Jets Over the Bay Committee v. Board of Port Commissioners* (2001) 91 Cal.App.4th 1344, 1370 ("The fact that a single methodology does not currently exist that would provide" the reviewing agencies with a "precise, or 'universally accepted,' quantification" of the Project's ILFN noise impacts "does not excuse the preparation of any health risk assessment"). The reviewing agencies must analyze and mitigate the Project's ILFN impacts.

O11-07

2. A-Weighted and Averaged Noise Measurements Are Insufficient to Capture ILFN

As shown in DEIS Sections 3.10 and 4.9, all the noise measurements presented and analyzed are A-weighted. Furthermore, many of them are time-averaged. DEIS 4.9-2 ("The primary indicator of noise levels for this analysis is the A-weighted average noise level measures in decibels (dBA Leq). The one-hour average noise level (dBA Leq [1-hour]) is often used to characterized ongoing operations

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comments as Exhibit 2); Pierpont, Nina, 2009, *Wind Turbine Syndrome: A Report on a Natural Experiment*, K-Selected Books: Santa Fé, NM; The Society for Wind Vigilance, January 2010, *Wind Industry Acknowledgment of Adverse Health Effects: An Analysis of the American/Canadian Wind Energy Association Sponsored "Wind Turbine Sound and Health Effects: An Expert Panel Review, December 2009*, available at http://www.windvigilance.com/awea_media.aspx.

or long-term effects."). These types of measurements are inadequate for evaluating ILFN production and exposure.

With respect to A-weighting, the A-weighted scale correlates well with human *perceptions* of the annoying aspects of noise. It does not correlate well with the impacts caused by inaudible sound pressures. Instead, the research uniformly shows that A-weighting underestimates the sound pressure level of noise with low-frequency components. Exhibit 1 at 19.[17]

O11-07 cont

The problem with time-averaged measurements is that through them "information on fluctuations [is] lost."[18] This is a significant issue in measuring ILFN because "[m]any complaints of low frequency noise refer to its throbbing or pulsing nature."[19] Numerous studies have confirmed that "amplitude-modulated sound is more easily perceived and more annoying than constant-level sounds and that sounds that are unpredictable and uncontrollable are more annoying than any other sounds." Exhibit 2 at 23.

Thus, in order to better measure ILFN and fully take into account the impacts of inaudible sound pressures, the reviewing agencies should (1) use non-averaged noise measurements in addition to the averaged measurements they use for other purposes, and (2) use C-, G- and/or Z-weighted measurements, which give more weight to infrasound and lower frequencies, in addition to A-weighted measurements (which are useful for measuring audible noise impacts).

3. Even the A-Weighted Noise Impacts Will be Significant

O11-08

Evidence demonstrates that "[a]nnoyance and sleep disruption are common when sound levels are 30 to 45 dBA."[20] DEIS Table 4.9-3 shows that the range of day-night average sound levels (from the Project wind turbines) for the four listed scenarios range from 45.8 dBA to 49.5 dBA at Location L1 and from 39.9 dBA to 44.2 dBA at L4, with the other locations having sound levels in between those two bounds. DEIS 4.9-7. These sound levels would likely be annoying to sensitive receptors as they are. DEIS 4.9-7 ("Therefore, these noise levels may result in complaints from local residences."). However, as explained by Richard James on page 7 of his October 6, 2011 Ocotillo Wind Project review, the listed decibel levels are actually vast underestimates because they have not been normalized to account for land use compatibility. Normalization increases the reported values by 15 dbA, to more than 60 dBA in some cases, making the Project's audible noise impacts much greater than acknowledged in the DEIS. BLM and the County must revise their analysis to account for these greater impacts. **O11-08 cont**

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[17] *See also,* World Health Organization, "Guidelines for Community Noise," 1999, section 2.3.3, available at: http://www.who.int/docstore/peh/noise/guidelines2.html; Minnesota Department of Health, Environmental Health Division, "Public Health Impacts of Wind Turbines," May 22, 2009, available at: http://www.health.state.mn.us/divs/eh/hazardous/topics/windturbines.pdf; M. Schust, "Effects of low frequency noise up to 100 Hz," *Noise & Health*, 23(6):73-85, 2004; HG Leventhall, "Low frequency noise and annoyance," *Noise & Health*, 23(6):59-72, 2004, available at:
http://www.noiseandhealth.org/article.asp?issn=1463-1741;year=2004;volume=6;issue=23;spage=59;epage=72;aulast=Leventhall.

[18] Geoff Leventhal, "Review of Published Research on Low Frequency Noise and Its Effects," *prepared for* Defra (U.K. Department of Environment, Food and Rural Affairs), May 2003, p. 35.

[19] *Id.*

4. Greater Mitigation Is Required

Here, there are dozens of residences within 1.25 miles of the proposed turbines on the Ocotillo Wind Project site, including those in the communities of Ocotillo and Coyote Wells (*see* DEIS 3.2-5; DEIS figures 3.6-3b, 4.18-9B). As discussed above, this is an inadequate setback. To avoid the negative health impacts from wind turbines, Dr. Nina Pierpont recommends setbacks from large wind projects of at least *1.25 miles*.[21] The reviewing agencies attempt to discredit Dr. Pierpont's study as a "small clinical case study [that] does not support a dose-response relationship." DEIS 3.12-6. But hers is not the only study recommending substantial wind turbine-residence buffers. A similar setback has been called for by the French National Academy of Medicine.[22] In his report for the Academy, Claude-Henri Chouard writes: **O11-09**

> The harmful effects of sound related to wind turbines are insufficiently assessed .... The sounds emitted by the blades being low frequency, which therefore travel easily and vary according to the wind, . . . constitute a permanent risk for the people exposed to them. . . . The Academy recommends halting wind turbine construction

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[20] Karen Rideout, Ray Copes and Constance Bos, "Wind Turbines and Health," *National Collaborating Centre for Environmental Health*, January 2010, p. 4, available at: http://www.ncceh.ca/sites/default/files/Wind_Turbines_January_2010.pdf. *See also* Eja Pedersen & Kerstin Persson Waye, "Perception and annoyance due to wind turbine noise – a does-response relationship," *Journal of the Acoustical Society of America*, 116(6), December 2004, available at: http://maine.gov/dep/blwq/docstand/sitelaw/Selected%20developments/Spruce_Mountain/additional_information/9_24_2010/fsm/exhibit_17.pdf.

[21] Nina Pierpont, 2009, *Wind Turbine Syndrome: A Report on a Natural Experiment*, K-Selected Books: Santa Fé, NM.

[22] Chouard, Claude-Henri, 2006, *Rapport: Le Retentissement du Fonctionnement des Éoliennes sur la Santé de l'Homme.*

closer than 1.5 km from residences.[23]

Here too the setbacks should be 1.25 miles.

B. Public Health Impacts – Dirty Electricity

Another impact insufficiently analyzed in the DEIS is that of electromagnetic field ("EMF") pollution, often referred to as "dirty electricity." Dirty electricity refers to the electromagnetic energy that flows along a conductor and deviates from a pure 60-Hz sine wave. As numerous electrical pollution measurements have shown, wind turbines can produce significant electrical pollution in the form of dirty electricity. And if not adequately filtered, dirty electricity can be propagated through the substations and onto transmission and distribution lines. By traveling both along power lines and through the ground, dirty electricity can impact people and structures more than 0.5 miles from the wind turbine source.

The health impacts of dirty electricity, like those of ILFN, can be severe. Until recently, dirty electricity had not been widely studied by the scientific community, but this is beginning to change. Recent studies, such as those by Dr. Samuel Milham and Dr. Magda Havas, have linked dirty electricity with an increase in ailments such as diabetes, fibromyalgia, chronic fatigue syndrome and attention deficit disorder, among others.[24] The DEIS, however, *entirely ignores* these recent studies. Instead, it summarizes studies that are – with the exception of one 2005 article by Feychting – *over a decade old* and generally demonstrate little more than the fact that there is a dearth of earlier research on the topic. DEIS 3.12-6 to 7 (describing, among other dated studies, a CPUC-initiated investigation that concluded, in 1993, with a CPUC decision (93-11-013) finding that "the body of scientific evidence continues to evolve"). This selective analysis stymies the informational goals of NEPA and CEQA and in no way constitutes a "hard look" at the Project's EMF pollution impacts.

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[23] *Id.*

[24] *See, e.g.,* Samuel Milham, "Attention Deficit Hyperactivity Disorder and Dirty Electricity," *Journal of Developmental and Behavioral Pediatrics*, September 2011 (attached hereto as Exhibit 3); Samuel Milham, "Historical Evidence That Electrification Caused the 20th Century Epidemic of 'Diseases of Civilization,'" *Medical Hypotheses*, 74:337-345, 2010 (attached hereto as Exhibit 4); Samuel Milham and L. Lloyd Morgan, "A New Electromagnetic Exposure Metric: High Frequency Voltage Transients Associated With Increased Cancer Incidence in Teachers in a California School," *American Journal of Industrial Medicine*, 2008 (attached hereto as Exhibit 5); Magda Havas, "Dirty Electricity Elevates Blood Sugar among Electrically Sensitive Diabetics and May Explain Brittle Diabetes," *Electromagnetic Biology and Medicine*, 27:135-146, 2008; Magda Havas, "Electromagnetic Hypersensitivity: Biological Effects of Dirty Electricity with Emphasis on Diabetes and Multiple Sclerosis," *Electromagnetic Biology and Medicine*, 25:259-268, 2006, available at: http://www.next-up.org/pdf/Magda_Havas_EHS_Biological_Effets_Electricity_Emphasis_Diabetes_Multiple_Sclerosis.pdf; The National Foundation for Alternative Medicine, "The health effects of electrical pollution," available at: http://d1fj3024k72gdx.cloudfront.net/health_effects.pdf.

The DEIS also improperly dismisses the Project's EMF pollution impacts as not being "expected to occur" due to "the underground installation of the proposed collection lines and the lack of nearby sensitive receptors." DEIS 4.11-13. While undergrounding is a necessary mitigation measure for EMF impacts, it is not enough to fully prevent EMF pollution since, as discussed above, dirty electricity can be propagated through the substations and onto above-ground transmission and distribution lines if it is not adequately filtered. And here, the Project would still utilize various above-ground power lines, including the transmission line connecting the utility switchyard to th Sunrise Powerlink 500-kV line, and the Sunrise Powerlink transmission line itself. *See* DEIS 2-5 to 6.

O11-10 cont

To comply with CEQA and NEPA, the reviewing agencies must fully analyze the Project's dirty electricity output and its impacts on people and the environment. The current meager analysis is insufficient.

C. Visual Impacts – Wind Turbine Shadow Flicker

Shadow flicker is one of the many side effects of wind turbines. A Michigan State University paper describes shadow flicker thusly:

> Shadow flicker is caused by the sun rising or setting behind the rotating blades of a turbine. The shadow created by the rotating blades can cause alternating light and dark shadows to be cast on roads or nearby premises, including the windows of residences, resulting in distraction and annoyance to the residents. A related phenomenon, strobe effect, is caused by the chopping of sunlight behind moving blades, similar to the effect of the setting sun behind trees when driving along a roadway in the winter.[25]

O11-11

The Minnesota Department of Health has also found that the "[r]hythmic light flicker from the blades of a wind turbine casting intermittent shadows has been reported to be annoying in many locations."[26] Shadow flicker can also present numerous dangers, such as distracting drivers on roads close to turbines. As a result of this road hazard, Ireland established guidelines requiring wind turbines to be set back at least 300 meters from roads.[27] Other mitigation measures for shadow flicker include shutting down the wind turbines during the time when shadow flicker would occur.

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[25] Michigan State University, "Land Use and Zoning Issues Related to Site Development for Utility Scale Wind Turbine Generators," 2004, p. 1, available at: http://web1.msue.msu.edu/cdnr/otsegowindflicker.pdf.

[26] Minnesota Department of Health, Environmental Health Division, "Public Health Impacts of Wind Turbines," May 22, 2009, p. 14.

O11-11 cont

Here, the DEIS briefly discusses the shadow flicker phenomenon, and even acknowledges that the Project would expose some sensitive receptors to it. DEIS 4.11-13. However, the DEIS entirely fails to examine two of the most significant shadow flicker impacts. First, despite the fact that two major highways – Imperial Highway S2 and Interstate 8 – run through portions of the Project site, the DEIS fails to examine the substantial road hazard shadow flicker presents by distracting drivers, let alone mitigate the impact as Ireland does via 300 meter setbacks. Second, the DEIS fails to acknowledge the pure visual annoyance that shadow flicker causes.[28] The reviewing agencies must analyze and mitigate these two additional impacts of shadow flicker.

D. Biological Impacts

O11-12

There are numerous biological impacts the reviewing agencies failed to adequately analyze in the DEIS, most prominently the impacts to birds and bats. These impacts – and the DEIS' insufficient analysis of them – is well documented by Jim Wiegand, in his October 6, 2011 comment letter to the reviewing agencies on behalf of Save the Eagles International. Conservation Groups generally agree with, and therefore incorporate by reference, Jim Wiegand's October 6, 2011 comments. Conservation Groups also provide the following discussion of the Project's biological impacts.

First, the DEIS fails to properly analyze the Project's contribution to total cumulative golden eagle mortality in California, as it is likely that the California golden eagle population will be driven close to extinction if many more wind farms and other anthropogenic sources of eagle mortality are developed in the state. This significant risk arises from the fact that there are only about 1,000 golden eagle breeding pairs in the state. Currently 167 of those breeding pairs are needed just to replace the 50 adult eagles killed on average every year by the Altamont Pass wind turbines, just one of the many anthropogenic sources of golden eagle mortality in California.[29]

Second, the DEIS fails to properly analyze the Project's noise impact on birds. As discussed above, the noise levels from operation of the Project's wind turbines alone would be well over 40 dBA in many places. These noise levels present a potentially significant adverse effect for avian species in the area. The threshold for noise significance is substantially lower for some sensitive avian species than what the Project will likely produce. Particularly sensitive species in – or potentially in – the Project area include the loggerhead shrike, burrowing owl and Le Conte's thrasher. DEIS 4.21-6 to 7. Expert testimony from Dr. Travis Longcore, given in the CPUC proceeding on the SDG&E's application for a certificate of public convenience and necessity for the Sunrise Powerlink project and attached as Exhibit 6 hereto, shows that the threshold for significant negative impacts on bird species similar to the birds just listed is likely "40 dB(A) or below." Exhibit 6 at 12. Dr. Longcore then goes on to discuss empirical data from California "indicating with certainty that territory occupancy is reduced by sound levels in the 50 - 60 Db(A) range" for the southwestern willow flycatcher (*id.* at 13), which is similarly susceptible to noise impacts as the California loggerhead shrike since both species are "small songbirds that rely on hearing songs to attract mates and defend territories." *Id.* at 12. The reviewing agencies must analyze and mitigate these impacts.

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[27] Michigan State University, "Land Use and Zoning Issues Related to Site Development for Utility Scale Wind Turbine Generators," 2004, p. 1.

[28] For a video of shadow flicker at a rural residence in Illinois, see: http://lifewithdekalbturbines.blogspot.com/2010/05/shadow-flicker-videos.html.

[29] *See* CEC PIER Program, Consultant Report, "Golden Eagles in a Perilous Landscape: Predicting the Effects of Mitigation for Wind Turbine Blade-Strike Mortality," July 2002, available at: http://www.energy.ca.gov/reports/2002-11-04_500-02-043F.PDF.

A third consideration that should have been omitted from the DEIS' biological impact analysis is the color of the Project's wind turbines. While lighter color turbines may be visually preferable for humans, at least one report concludes that white, light gray and yellow turbines may attract the most flying insects – and hence birds and bats that feed on those insects.[30] The report found that purple was the color least likely to attract insects. The reviewing agencies should further analyze the choice of Project facility colors.

O11-12 cont

E. Hydrological Impacts

The proposed location of the Ocotillo Wind Project is very arid and water supplies are limited. Furthermore, the Project is located atop the Ocotillo-Coyote Wells Sole Source Aquifer. DEIS 3.20-5. Therefore it is critically important that the reviewing agencies ensure that the Project would have minimal impacts to the region's surface and groundwater supplies. This entails analysis and mitigation of the Project's potential water quality impacts, as well as identification of sufficient water supplies to meet the Project's needs and analysis of the impacts of procuring that water. *See Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 446 (EIRs must "demonstrate a reasonable likelihood that water will be available for the project from an identified source"). The DEIS here fails to adequately analyze water supply and other hydrologic impacts.

With respect to water supplies, the DEIS is deficient because it does not demonstrate with reasonable certainty that water will be available for the Project. For instance, the DEIS states that "[a]pproximately 50 acre-feet of water would be required over" the two phases of construction, "to be obtained from a private groundwater well near Pine Valley, in eastern San Diego County." DEIS 4.19-3. However, the DEIS provides *no specifics* as to who owns the well, whether a contract has been entered into for purchase of well water, or how the pumping of water from the Pine Valley well would

O11-13

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[30] Laura Roberts, "Wind turbines should be painted purple to deter bats, scientists claim," *The Telegraph*, October 15, 2010, available at: http://www.telegraph.co.uk/earth/earthnews/8066012/Wind-turbines-should-be-painted-purple-to-deter-bats-scientists-claim.html.

impact the sensitive and important Campo-Cottonwood Sole Source Aquifer from which it draws its water. Indeed, the DEIS provides almost no information from which to assess the likelihood that 50 acre-feet will be available from the Pine Valley well. The DEIS does mention that a "Water Supply Assessment has been conducted for use of the Pine Valley well, which confirms that the project's planned usage will not adversely impact the aquifer that supplies the well." DEIS 2-9. Yet the DEIS neither includes (or incorporates by reference) the alleged Water Supply Assessment, nor provides any more details about it.

The DEIS' analysis of the Project's operational water supplies is even more defective. As the DEIS states, "[a]t the time of preparation of this Draft EIS/EIR, a commercial water supplier *has not been identified*." DEIS 4.19-12 (emphasis added). This is entirely unacceptable. The DEIS must "demonstrate a reasonable likelihood that water will be available for the project from an identified source." *Vineyard Area Citizens for Responsible Growth, Inc.*, 40 Cal.4th at 446. This failure is not excused by the reviewing agencies' assertion that "it is reasonably assumed that the IID would provide operational water unless such water would be obtained from the groundwater well(s) in Pine Valley." DEIS 4.19-12. Contrary to the erroneous statement in the DEIS, the Project is *out of* IID's service territory and thus the Project applicant would need to obtain a special approval to purchase and use its water. There is no indication that the applicant has even contacted IID about this possibility, let alone sought an approval to purchase its water.

In sum, the DEIS wholly fails to provide both an adequate water supply analysis and an adequate analysis of the Project's impacts to the Campo-Cottonwood Sole Source Aquifer and the Ocotillo-Coyote Wells Sole Source Aquifer.

O11-13 cont

IV. Improper Deferred Specification of Mitigation Measures

______The DEIR improperly deferred specification of numerous mitigation measures until after the completion of environmental review. This violates both CEQA and NEPA. CEQA Guidelines § 15126.4(a)(2); *Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 306-308; *National Parks & Conservation Association v. Babbitt*, 241 F.3d 722, 732-736 (9th Cir. 2001) (impact and mitigation "studies must be conducted first, not afterwards."). The improperly deferred measures include, among others, the Spill Prevention Containment and Countermeasure Plan, the Construction Waste Management Plan, the Restoration Plan, the Noxious Weed Control Program, the Integrated Pest Management Program, the Traffic Management Plan, the Transportation Plan, the Storm Water Pollution Prevention Plan, the Cultural Resource Monitoring and Mitigation Plan, the Fugitive Dust Control Plan, the Dust Abatement Plan, and the Avian and Bat Protection Plan and Eagle Conservation Plan. This flouts CEQA and NEPA and must be remedied by BLM and the County.

O11-14

V. Conclusion

Conservation Groups oppose this Project as an unnecessary industrialization of pristine desert wildland areas. Echoing a growing chorus of opinions on this subject, Conservation Groups urge the reviewing agencies to analyze and adopt as an alternative to the proposed project the development of

O11-15

O11-15 cont

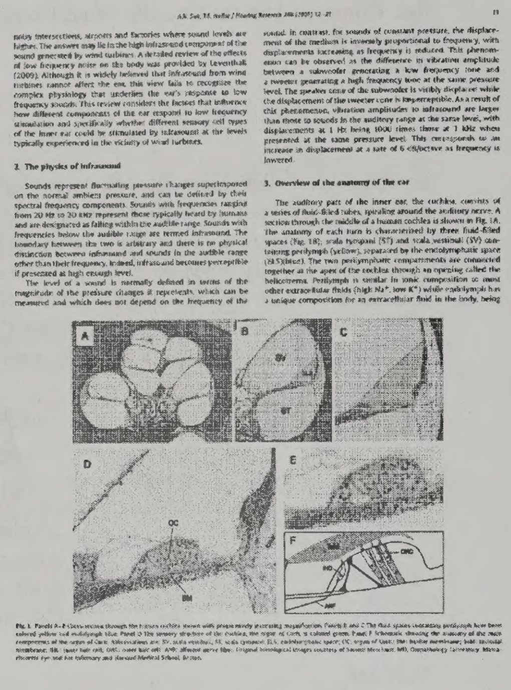
non-fossil fuel distributed generation projects near demand centers in already-disturbed areas. The combined effects of all of the energy projects proposed in the deserts of Southern California and the Southwest in general, including the present Project, will fundamentally alter the region in ways that have not been fully revealed or analyzed to date. The best way to provide for the future energy needs of Southern Californians – and the United States as a whole – is not through destructive development of their irreplaceable wildlands, but rather through the deployment of distributed generation facilities at already disturbed locations within or near the urban demand centers.

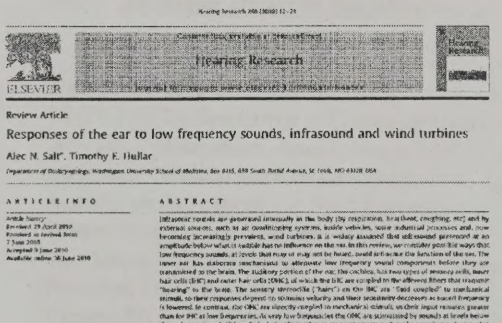
Sincerely,

Stephan C. Volker
Attorney for Desert Protective Council, The Protect Our Communities Foundation, Backcountry Against Dumps, East County Community Action Coalition and Donna Tisdale

SCV:taf

EXHIBIT 1





Hearing Research 268 (2010) 12–21

Hearing Research

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Review Article

Responses of the ear to low frequency sounds, infrasound and wind turbines

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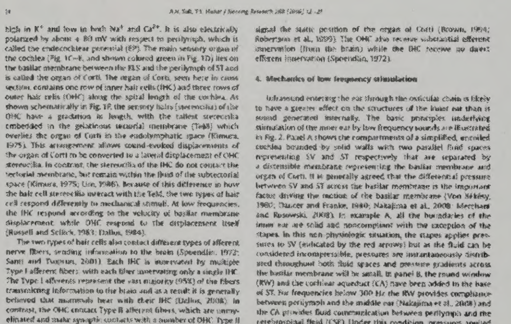
ABSTRACT

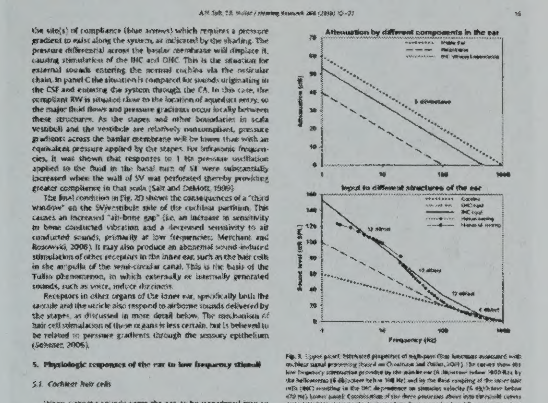
1. Introduction

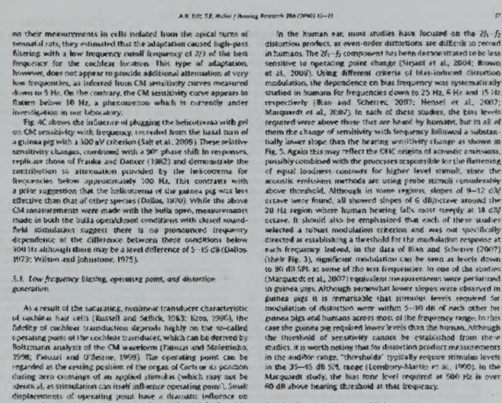
2. The physics of infrasound

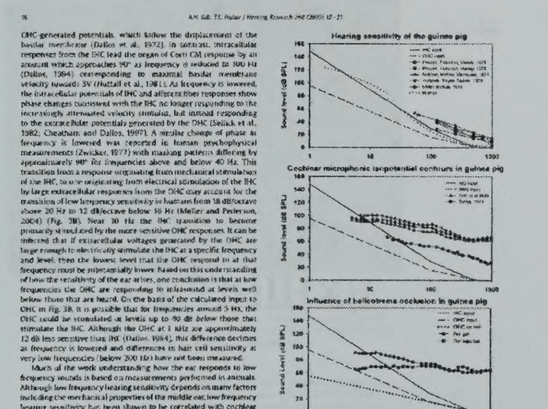
3. Overview of the anatomy of the ear

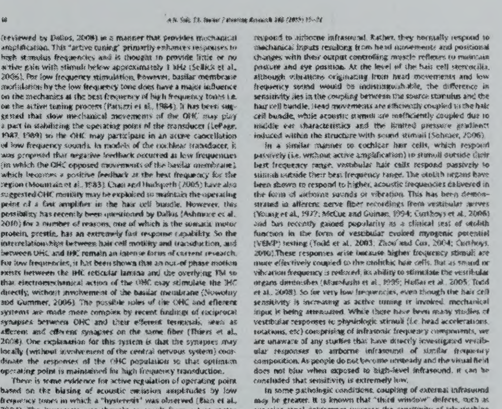


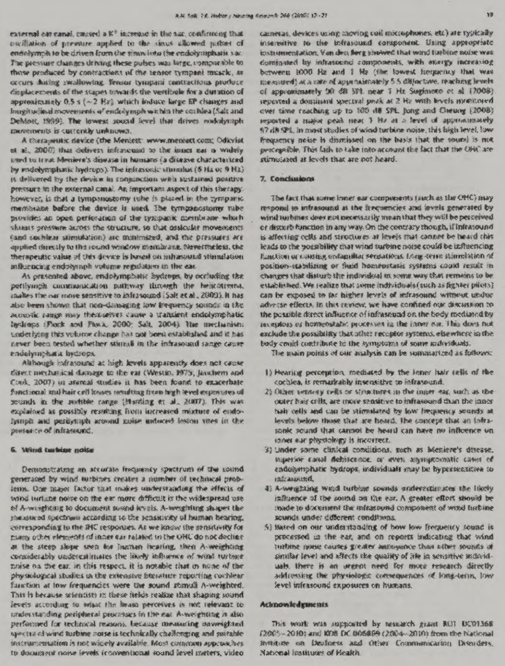
4. Mechanics of low frequency stimulation

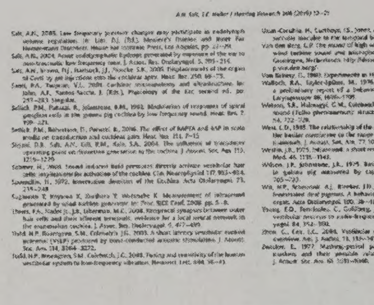


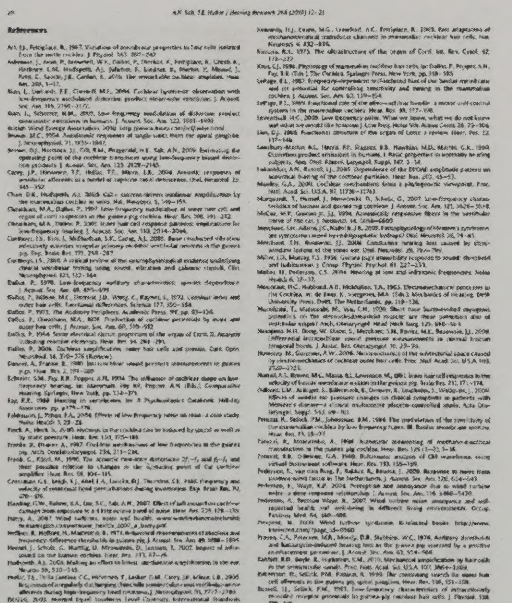












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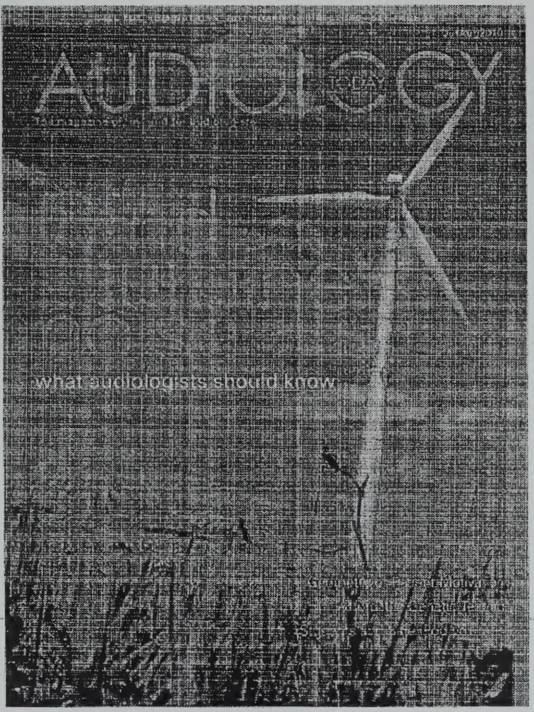

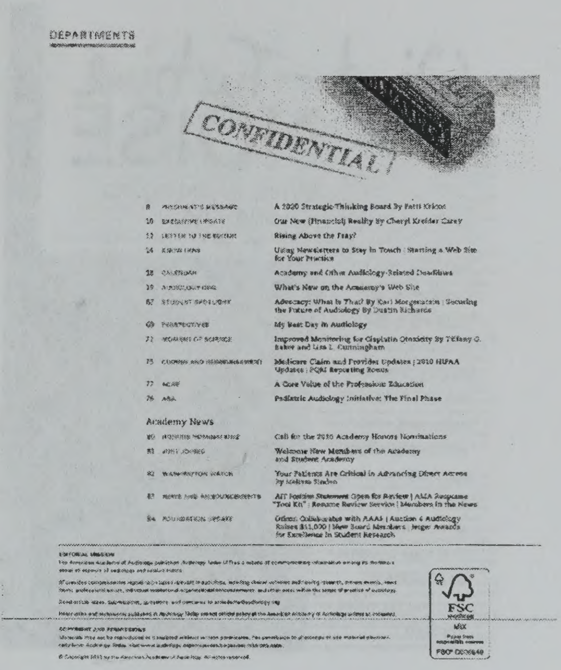
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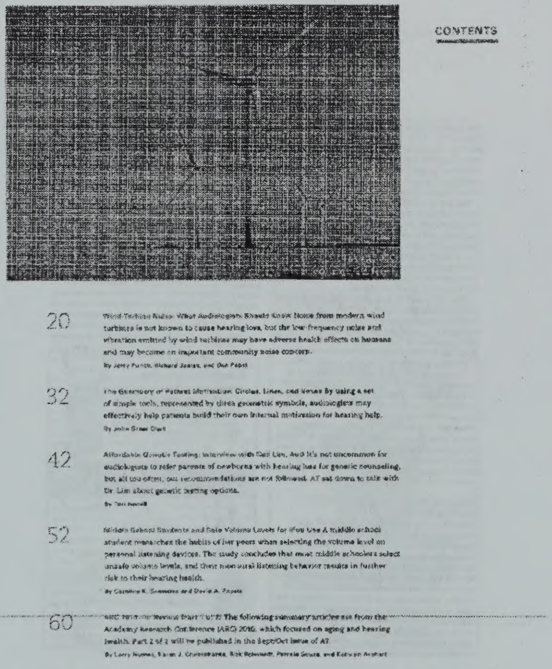
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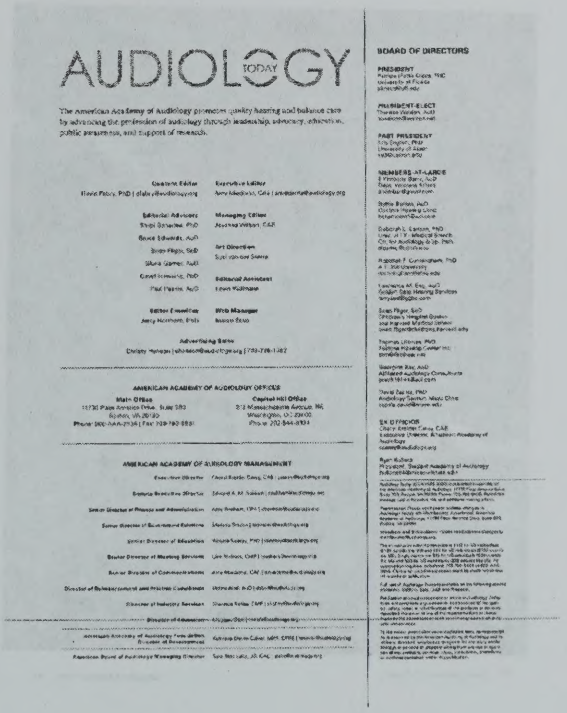
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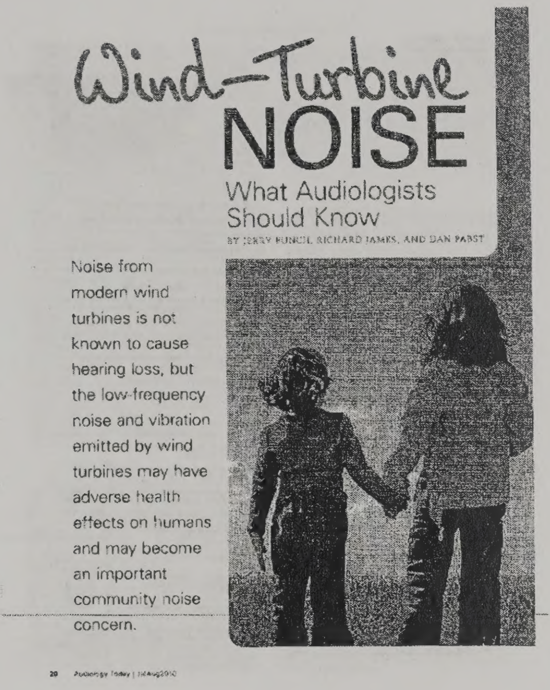
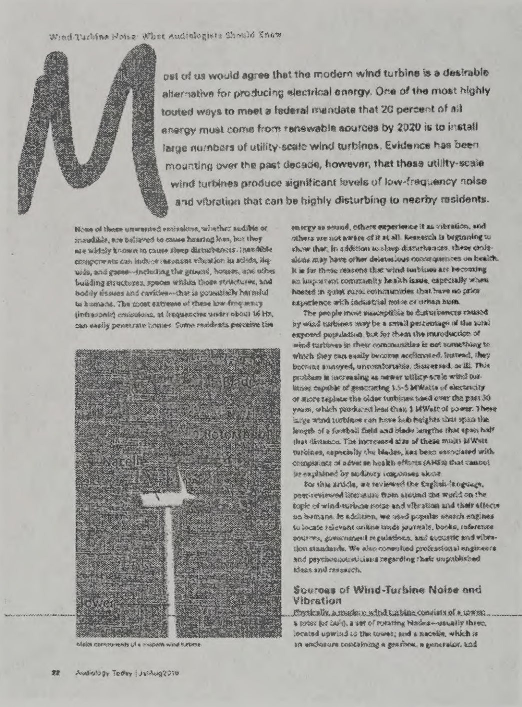


Wind-Turbine NOISE
What Audiologists Should Know

BY JERRY PUNCH, RICHARD JAMES, AND DAN PABST

Noise from modern wind turbines is not known to cause hearing loss, but the low-frequency noise and vibration emitted by wind turbines may have adverse health effects on humans and may become an important community noise concern.



Most of us would agree that the modern wind turbine is a desirable alternative for producing electrical energy. One of the most highly touted ways to meet a federal mandate that 20 percent of all energy must come from renewable sources by 2020 is to install large numbers of utility-scale wind turbines. Evidence has been mounting over the past decade, however, that these utility-scale wind turbines produce significant levels of low-frequency noise and vibration that can be highly disturbing to nearby residents.

None of these unwanted emissions, whether audible or inaudible, are believed to cause hearing loss, but they are widely known to cause sleep disturbances. Inaudible components can induce resonant vibration in solids, liquids, and gases—including the ground, houses, and other building structures, spaces within those structures, and bodily tissues and cavities—that is potentially harmful to humans. The most extreme of these low-frequency (infrasonic) emissions, at frequencies under about 16 Hz, can easily penetrate homes. Some residents perceive the energy as sound, others experience it as vibration, and others are not aware of it at all. Research is beginning to show that, in addition to sleep disturbances, these emissions may have other deleterious consequences on health. It is for these reasons that wind turbines are becoming an important community health issue, especially when hosted in quiet rural communities that have no prior experience with industrial noise or urban hum.

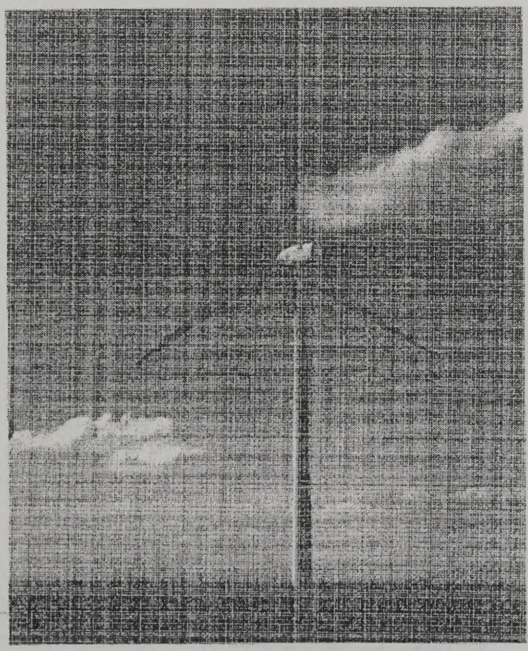
The people most susceptible to disturbances caused by wind turbines may be a small percentage of the total exposed population, but for them the introduction of wind turbines in their communities is not something to which they can easily become acclimated. Instead, they become annoyed, uncomfortable, distressed, or ill. This problem is increasing as newer utility-scale wind turbines capable of generating 1.5–5 MWatts of electricity or more replace the older turbines used over the past 30 years, which produced less than 1 MWatt of power. These large wind turbines can have hub heights that span the length of a football field and blade lengths that span half that distance. The increased size of these multi-MWatt turbines, especially the blades, has been associated with complaints of adverse health effects (AHEs) that cannot be explained by auditory responses alone.

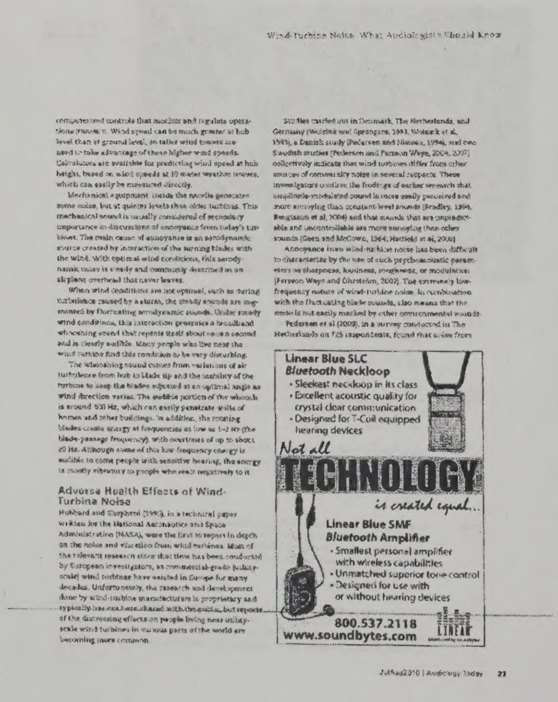
For this article, we reviewed the English-language, peer-reviewed literature from around the world on the topic of wind-turbine noise and vibration and their effects on humans. In addition, we used popular search engines to locate relevant online trade journals, books, reference sources, government regulations, and acoustic and vibration standards. We also consulted professional engineers and psychoacousticians regarding their unpublished ideas and research.

Main components of a modern wind turbine.

Sources of Wind-Turbine Noise and Vibration

Physically, a modern wind turbine consists of a tower; a rotor (or hub); a set of rotating blades—usually three, located upwind to the tower; and a nacelle, which is an enclosure containing a gearbox, a generator, and computerized controls that monitor and regulate operations (Figure 1). Wind speed can be much greater at hub level than at ground level, so taller wind towers are used to take advantage of these higher wind speeds. Calculators are available for predicting wind speed at hub height, based on wind speeds at 10 meter weather towers, which can easily be measured directly.





Mechanical equipment inside the nacelle generates some noise, but at quieter levels than older turbines. This mechanical sound is usually considered of secondary importance in discussions of annoyance from today's turbines. The main cause of annoyance is an aerodynamic source created by interaction of the turning blades with the wind. With optimal wind conditions, this aerodynamic noise is steady and commonly described as an airplane overhead that never leaves.

When wind conditions are not optimal, such as during turbulence caused by a storm, the steady sounds are augmented by fluctuating aerodynamic sounds. Under steady wind conditions, this interaction generates a broadband whooshing sound that repeats itself about once a second and is clearly audible. Many people who live near the wind turbine find this condition to be very disturbing.

The whooshing sound comes from variations of air turbulence from hub to blade tip and the inability of the turbine to keep the blades adjusted at an optimal angle as wind direction varies. The audible portion of the whoosh is around 500 Hz, which can easily penetrate walls of homes and other buildings. In addition, the rotating blades create energy at frequencies as low as 1–2 Hz (the blade-passage frequency), with overtones of up to about 20 Hz. Although some of this low-frequency energy is audible to some people with sensitive hearing, the energy is mostly vibratory to people who react negatively to it.

Adverse Health Effects of Wind-Turbine Noise

Hubbard and Shepherd (1990), in a technical paper written for the National Aeronautics and Space Administration (NASA), were the first to report in depth on the noise and vibration from wind turbines. Most of the relevant research since that time has been conducted by European investigators, as commercial-grade (utility-scale) wind turbines have existed in Europe for many decades. Unfortunately, the research and development done by wind-turbine manufacturers is proprietary and typically has not been shared with the public, but reports of the distressing effects on people living near utility-scale wind turbines in various parts of the world are becoming more common.

Studies carried out in Denmark, The Netherlands, and Germany (Wolsink and Sprengers, 1993; Wolsink et al, 1993), a Danish study (Pedersen and Nielsen, 1994), and two Swedish studies (Pedersen and Persson Waye, 2004, 2007) collectively indicate that wind turbines differ from other sources of community noise in several respects. These investigators confirm the findings of earlier research that amplitude-modulated sound is more easily perceived and more annoying than constant-level sounds (Bradley, 1994; Bengtsson et al, 2004) and that sounds that are unpredictable and uncontrollable are more annoying than other sounds (Geen and McCown, 1984; Hatfield et al, 2002).

Annoyance from wind-turbine noise has been difficult to characterize by the use of such psychoacoustic parameters as sharpness, loudness, roughness, or modulation (Persson Waye and Öhrström, 2002). The extremely low-frequency nature of wind-turbine noise, in combination with the fluctuating blade sounds, also means that the noise is not easily masked by other environmental sounds.

Pedersen et al (2009), in a survey conducted in The Netherlands on 725 respondents, found that noise from

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wind turbines is more annoying than transportation or industrial noises at comparable levels, measured in dBA. They noted that annoyance from turbine sounds at 35 dBA corresponds to the annoyance reported for other common community-noise sources at 45 dBA. Higher visibility of the turbines was associated with higher levels of annoyance, and annoyance was greater when attitudes toward the visual impact of the turbines on the landscape were negative. However, the height of wind turbines means that they are also most clearly visible to the people closest to them and those who also receive the highest sound levels. Thus, proximity of the receiver to wind turbines makes it difficult to determine whether annoyance to the noise is independent of annoyance to the visual impact. Pedersen et al (2009) also found that annoyance was substantially lower in people who benefited economically from having wind turbines located on their property.

Among audiologists and acousticians, it has been understood for many decades that sufficiently intense and prolonged exposure to environmental noise can cause hearing impairment, annoyance, or both. In essence, the view has been, what you can hear can hurt you. In the case of wind turbines, it seems that what you can't hear can also hurt you. Again, there is no evidence that noise generated by wind turbines, even the largest utility-scale turbines, causes hearing loss. But there is increasingly clear evidence that audible and low-frequency acoustic energy from these turbines is sufficiently intense to cause extreme annoyance and inability to sleep, or disturbed sleep, in individuals living near them.

Table 1. Core Symptoms of Wind-Turbine Syndrome

1	Sleep disturbance
2	Headache
3	Visceral Vibratory Vestibular Disturbance (VVVD)
4	Dizziness, vertigo, unsteadiness
5	Tinnitus
6	Ear pressure or pain
7	External auditory canal sensation
8	Memory and concentration deficits
9	Irritability, anger
10	Fatigue, loss of motivation

Source: Pierpont, 2009

Jung and colleagues (2008), in a Korean study, concluded that low-frequency noise in the frequency range above 30 Hz can lead to psychological complaints and that infrasound in the frequency range of 5–8 Hz can cause complaints due to rattling doors and windows in homes.

The energy generated by large wind turbines can be especially disturbing to the vestibular systems of some people, as well as cause other troubling sensations of the head, chest, or other parts of the body. Dr. Nina Pierpont (2009), in her definitive natural experiment on the subject, refers to these effects as Wind-Turbine Syndrome (WTS). TABLE 1 lists the symptoms that, in various combinations, characterize WTS. Although hearing impairment is not one of the symptoms of WTS, audiologists whose patients report these symptoms should ask them if they live near a wind turbine.

It is well known that sleep deprivation has serious consequences, and we know that noncontinuous sounds and nighttime sounds are less tolerable than continuous and daytime sounds. Somewhat related effects, such as cardiac arrhythmias, stress, hypertension, and headaches have also been attributed to noise or vibration from wind turbines, and some researchers are referring to these effects as Vibroacoustic Disease, or VAD (Castelo Branco, 1999; Castelo Branco and Alves-Pereira, 2004). VAD is described as occurring in persons who are exposed to high-level (>90 dB SPL) infra- and low-frequency noise (ILFN), under 500 Hz, for periods of 10 years or more. It is believed to be a systemic pathology characterized by direct tissue damage to a variety of bodily organs and may involve abnormal proliferation of extracellular matrices.

Alves-Pereira and Castelo Branco (2007) reported on a family who lived near wind turbines and showed signs of VAD. The sound levels in the home were less than 60 dB SPL in each 1/3-octave band below 100 Hz. We have measured unweighted sound levels ranging from 60 to 70 dB Leq (averaged over 1 minute) in these low-frequency bands in Ontario homes of people reporting AHEs from wind turbines. A spectral analysis of sounds emitted at a Michigan site revealed that unweighted peak levels at frequencies under 5 Hz exceeded 90 dB SPL (Wade Bray, pers. comm., 2009).

Similar observations have been made in studies of people who live near busy highways and airports, which also expose people to low-frequency sounds, both outdoors and in their homes. Evidence is insufficient to substantiate that typical exposures to wind-turbine noise, even in residents who live nearby, can lead to VAD, but early indications are that there are some more-vulnerable people who may be susceptible. Because ILFN is not yet recognized as a disease agent, it is not covered by legislation, permissible exposure levels have not yet been established, and dose-response relationships are unknown (Alves-Pereira, 2007).

As distinguished from VAD, Pierpont's (2009) use of the term Wind-Turbine Syndrome appears to emphasize a constellation of symptoms due to stimulation, or overstimulation, of the vestibular organs of balance due to ILFN from wind turbines (see TABLE 1). One of the most distinctive symptoms she lists in the constellation of symptoms comprising WTS is Visceral Vibratory Vestibular Disturbance (VVVD), which she defines as "a sensation of internal quivering, vibration, or pulsation accompanied by agitation, anxiety, alarm, irritability, rapid heartbeat, nausea, and sleep disturbance" (p. 270).

Drawing on the recent work of Balaban and colleagues (i.e., Balaban and Yates, 2004), Pierpont describes the close association between the vestibular system and its neural connections to brain nuclei involved with balance processing, autonomic and somatic sensory inflow and outflow, the fear and anxiety associated with vertigo or a sudden feeling of postural instability, and aversive learning. These neurological relationships give credence to Pierpont's linkage of the symptoms of VVVD to the vestibular system.

Todd et al (2008) demonstrated that the resonant frequency of the human vestibular system is 100 Hz, concluding that the mechano-receptive hair cells of the vestibular structures of the inner ear are remarkably sensitive to low-frequency vibration and that this sensitivity to vibration exceeds that of the cochlea. Not only is 100 Hz the frequency of the peak response of the vestibular system to vibration, but it is also a frequency at which a substantial amount of acoustic energy is produced by wind turbines. Symptoms of both VAD and VVVD can presumably occur in the presence of ILFN as a result of disruptions of normal paths or structures that mediate the fine coordination between living tissue deformation and activation of signal transducers; these disruptions can lead to aberrant mechano-electrical coupling that can, in turn, lead to conditions such as heart arrhythmias (Ingber, 2008). Ultimately, further research will be needed to sort out the commonalities and differences among the symptoms variously described in the literature as VAD, VVVD, and WTS.

Dr. Geoff Leventhall, a British scientist, and his colleagues (Waye et al, 1997; Leventhall, 2003, 2004) have documented the detrimental effects of low-frequency noise exposure. They consider it to be a special environmental noise, particularly to sensitive people in their homes. Waye et al (1997) found that exposure to dynamically modulated low-frequency ventilation noise (20–200 Hz)—as opposed to midfrequency noise exposure—was more bothersome, less pleasant, impacted work performance more negatively, and led to lower social orientation.

Leventhall (2003), in reviewing the literature on the effects of exposure to low-frequency noise, found no evidence of hearing loss but substantial evidence of vibration of bodily structures (chest vibration), annoyance (especially in homes), perceptions of unpleasantness (pressure on the eardrum, unpleasant perception within the chest area, and a general feeling of vibration), sleep disturbance (reduced wakefulness), stress, reduced performance on demanding verbal tasks, and negative biological effects that included quantitative measurements of EEG activity, blood pressure, respiration, hormone production, and heart rate.

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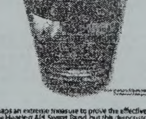

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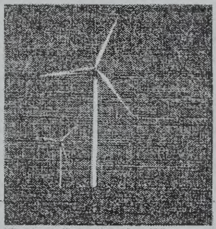
Regarding work performance, reviewed studies indicated that dynamically modulated low-frequency noise, even when inaudible to most individuals, is more difficult to ignore than mid- or high-frequency noise and that its imperviousness to habituation leads to reduced available information-processing resources. Leventhall hypothesized that low-frequency noise, therefore, may impair work performance. More recently, as a consultant on behalf of the British Wind Energy Association (BWEA), the American Wind Energy Association (AWEA), and the Canadian Wind Energy Association (CANWEA), Leventhall (2006) changed his position, stating that although wind turbines do produce significant levels of low-frequency sound, they do not pose a threat to humans—in effect reverting to the notion that what you can't hear can't hurt you.

According to the World Health Organization guidelines (WHO, 2007), observable effects of nighttime, outdoor wind-turbine noise do not occur at levels of 30 dBA or lower. Many rural communities have ambient, nighttime sound levels that do not exceed 25 dBA. As outdoor sound levels increase, the risk of AHEs also increases, with the most vulnerable being the first to show its effects. Vulnerable populations include elderly persons, children, especially those younger than age six, and people with pre-existing medical conditions, especially if sleep is affected. For outdoor sound levels of 40 dBA or higher, the WHO states that there is sufficient evidence to link prolonged exposure to AHEs. While the WHO identifies long-term, nighttime audible sounds over 40 dBA outside one's home as a cause of AHEs, the wind industry commonly promotes 50 dBA as a safe limit for nearby homes and properties. Recently, a limit of 45 dBA has been proposed for new wind projects in Canada (Keith et al, 2008).



Utility-scale wind turbines located in Huron County, Michigan.

Much of the answer as to why the wind industry denies that noise is a serious problem with its wind turbines is because holding the noise to 30 dBA at night has serious economic consequences. The following quotation by Upton Sinclair seems relevant here: "It is difficult to get a man to understand something when his salary depends upon his not understanding it" (Sinclair, 1935, reprinted 1994, p. 109).

In recent years, the wind industry has denied the validity of any noise complaints by people who live near its utility-scale wind turbines. Residents who are leasing their properties for the siting of turbines are generally so pleased to receive the lease payments that they seldom complain. In fact, they normally are required to sign a leasing agreement, or gag clause, stating they will not speak or write anything unfavorable about the turbines. Consequently, complaints, and sometimes lawsuits, tend to be initiated by individuals who live next to property on which wind turbines are sited, and not by those who are leasing their own property. This situation pits neighbor against neighbor, which leads to antagonistic divisions within communities.

Measurement of Wind-Turbine Noise

It is important to point out that the continued use of the A-weighting scale in sound-level meters is the basis for misunderstandings that have led to acrimony between advocates and opponents of locating wind turbines in residential areas. The dBA scale grew out of the desire to incorporate a function into the measurement of sound pressure levels of environmental and industrial noise that is the inverse of the minimum audibility curve (Fletcher and Munson, 1933) at the 40-phon level. It is typically used, though, to specify the levels of noises that are more intense, where the audibility curve becomes considerably flattened, obviating the need for A-weighting. It is mandated in various national and international standards for measurements that are compared to damage-risk criteria for hearing loss and other health effects. The A-weighted scale in sound-level meters drastically reduces sound-level readings in the lower frequencies, beginning at 1000 Hz, and reduces sounds at 20 Hz by 50 dB.

For wind-turbine noise, the A-weighting scale is especially ill-suited because of its devaluation of the effects of low-frequency noise. This is why it is important to make C-weighted measurements, as well as A-weighted measurements, when considering the impact of sound from wind turbines. Theoretically, linear-scale measurements would seem superior to C-scale measurements in wind-turbine applications, but linear scale measurements lack standardization due to failure on the part of manufacturers of sound-level meters to agree on such factors as low-frequency cutoff and response tolerance limits. The Z-scale, or zero-frequency weighting, was introduced in 2003 by the International Electro-technical Commission (IEC) in its Standard 61672 to replace the flat, or linear, weighting used by manufacturers in the past.

State of Michigan Siting Guidelines

Michigan's siting guidelines (State of Michigan, 2008) will be used as an example of guidelines that deal only in a limited way with sound. These guidelines refer to earlier, now outdated, WHO and Environmental Protection Agency (EPA) guidelines to support a noise criterion that SPLs cannot exceed 55 dBA at the adjacent property line. This level is allowed to be exceeded during severe weather or power outages, and when the ambient sound level is greater than 55 dBA, the turbine noise can exceed that higher background sound level by 5 dB. These levels are about 30 dB above the nighttime levels of most rural communities. When utility-scale turbines were installed in Huron County, Michigan, in May 2008, the WHO's 2007 guidelines that call for nighttime, outside levels not to exceed 30 dBA were already in place. Based on measurements made by the authors, these turbines produce 40–45 dBA sound levels at the perimeter of a 1,000 ft radius under typical weather conditions, and the additive effects of multiple turbines produce higher levels. Many of the turbines have been located close enough to homes to produce very noticeable noise and vibration.

Kamperman and James (2009) have offered recommendations for change in the State of Michigan guidelines (2008) for wind turbines. Some of the more pertinent details of the Michigan siting guidelines are shown in the left-hand column of TABLE 2. The state of Michigan permits sound levels that do not exceed 55 dBA or L90 + 5 dBA, whichever is greater, measured at the property line closest to the wind-energy system. These guidelines make no provisions to limit low-frequency sounds from wind-turbine operations.

In consideration of the current WHO guidelines (2007), measurements made by the authors in Huron County, Michigan, indicate that the current Michigan guidelines do not appear adequate to protect the public from the nuisances and known health risks of wind-turbine noise. In fact, these guidelines appear to be especially lenient

Table 2. Current and Proposed Wind-Turbine Siting Guidelines

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

*Source: State of Michigan, 2008

**Source: Kamperman and James, 2008

in terms of tolerable sound levels. Sound levels that approach 20 dBA higher than natural ambient levels are considered unacceptable in most countries; Michigan permits 10 dBA increases.

In considering the health and well-being of people living near wind-turbine projects, the changes recommended by Kamperman and James (2009) would abandon the 55 dBA limit in favor of the commonly accepted criteria of L90 + 5 dBA, for both A- and C-scale readings, where L90 is the preconstruction ambient level. These recommendations also include a prohibition against any wind-turbine-related sound levels exceeding 35 dBA on receiving properties that include homes or other structures in which people sleep. Additional protections against low-frequency sound are given in the right-hand column of TABLE 1. These recommended provisions would protect residents by limiting the difference between C-weighted Leq during turbine operation and the quietest A-weighted pre-operation background sound levels, plus 5 dB, to no more than 20 dB at the property line. This level should not exceed 55 dB Leq on the C scale, or 60 dB Leq for properties within one mile of major heavily trafficked roads, which sets a higher tolerance for communities that tend to experience slightly noisier conditions.

People living near wind turbines may experience sleep disturbance.

Implementation of the recommendations of Kamperman and James would result in siting wind turbines differently than what is currently planned for future wind-turbine projects in Michigan. This change would result in sound levels at nearby properties that are much less noticeable, and much less likely to cause sleep deprivation, annoyance, and related health risks. These sound-level measurements should be made by independent acoustical engineers or knowledgeable audiologists who follow ANSI guidelines (1993, 1994) to ensure fair and accurate readings, and not by representatives of the wind industry.

People living within a mile of one or more wind turbines, and especially those living within a half mile, have frequent sleep disturbance leading to sleep deprivation, and sleep disturbances are common in people who live up to about 1.25 miles away. This is the setback distance at which a group of turbines would need to be in order not to be a nighttime noise disturbance (Kamperman and James, 2009). It is also the setback distance used in several other countries that have substantial experience with wind turbines, and is the distance at which Pierpont (2009) found very few people reporting AHEs.

A study conducted by van den Berg (2003) in The Netherlands demonstrated that daytime levels cannot be used to predict nighttime levels and that residents within 1900 m (1.18 mile) of a wind-turbine project expressed annoyance from the noise. Pierpont (2009) recommends baseline minimum setbacks of 2 kilometers (1.24 mile) from residences and other buildings such as hospitals, schools, and nursing homes, and longer setbacks in mountainous terrain and when necessary to meet the noise criteria developed by Kamperman and James (2009).

In a panel review report, the American Wind Energy Association (AWEA) and Canadian Wind Energy Association (CANWEA) have objected to setbacks that exceed 1 mile (Colby et al, 2009). A coalition of independent medical and acoustical experts, the Society for Wind Vigilance (2010), has provided a recent rebuttal to that report. The society has described the panel review as a typical product of industry-funded white papers, being neither authoritative nor convincing. The society accepts as a medical fact that sleep disturbance, physiological stress, and psychological distress can result from exposure to wind-turbine noise.

Wind turbines have different effects on different people. Some of these effects are somewhat predictable based on financial compensation, legal restrictions on free speech included in the lease contracts with hosting landowners, and distance of the residence from wind projects, but they are sometimes totally unpredictable. Planning for wind projects needs to be directed not only toward benefiting society at large but also toward protecting the individuals living near them. We believe that the state of Michigan, and other states that have adopted similar siting guidelines for wind turbines, are not acting in the best interest of all their citizens and need to revise their siting guidelines to protect the public from possible health risks and loss of property values, as well as reduce complaints about noise annoyance.

Wind-utility developers proposing new projects to a potential host community are often asked if their projects will cause the same negative community responses that are heard from people living in the footprint of operating projects. They often respond that they will use a different

type of wind turbine or that reports of complaints relate to older-style turbines that they do not use. In our opinion, these statements should usually be viewed as diversionary.

Finally, it is important to note that there is little difference in noise generated across makes and models of modern utility-scale, upwind wind turbines once their power outputs are normalized. Kamperman (pers. comm., 2009), after analyzing data from a project funded by the Danish Energy Authority (Søndergaard and Madsen, 2008), has indicated that when the A-weighted sound levels are converted to unweighted levels, the low-frequency energy from industrial wind turbines increases inversely with frequency at a rate of approximately 3 dB per octave to below 10 Hz (the lowest reported frequency). Kamperman has concluded that the amount of noise generated at low frequencies increases by 3–5 dB for every MW of electrical power generated. Because turbines are getting larger, this means that future noise problems are likely to get worse if siting guidelines are not changed.

Conclusion

Our purpose in this article has been to provide audiologists with a better understanding of the types of noise generated by wind turbines, some basic considerations underlying sound-level measurements of wind-turbine noise, and the adverse health effects on people who live near these turbines. In future years, we expect that audiologists will be called upon to make noise measurements in communities that have acquired wind turbines, or are considering them. Some of us, along with members of the medical profession, will be asked to provide legal testimony regarding our opinions on the effects of such noise on people. Many of us will likely see clinical patients who are experiencing some of the adverse health effects described in this article.

As a professional community, audiologists should become involved not only in making these measurements to corroborate the complaints of residents living near wind-turbine projects but also in developing and shaping siting guidelines that minimize the potentially adverse health effects of the noise and vibration they generate. In these ways, we can promote public health interests without opposing the use of wind turbines as a desirable and viable alternative energy source. ●

Jerry Punch, PhD, Richard James, INCE, and Dan Pabst, BS, are with the Department of Communicative Sciences and Disorders, Michigan State University, East Lansing, MI

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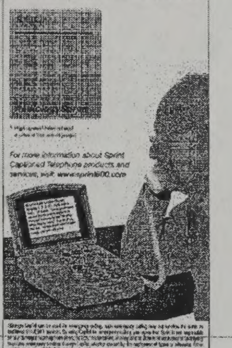

Portions of this work were presented at the Annual Convention of the American Speech-Language-Hearing Association (ASHA), November 2009, New Orleans, LA.

Acknowledgments. We wish to thank the many families and residents of Huron County, Michigan, with whom we spent many hours discussing a variety of issues related to their concerns about the noise and vibration from nearby wind turbines. Their involvement, and especially their compelling stories, provided information and encouragement that led us to the belief that this work should be shared with members of the audiology profession.

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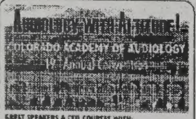

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Attention Deficit Hyperactivity Disorder and Dirty Electricity

To the Editor:

In February 2010, while studying a cancer cluster in teachers at a California elementary school, a fourth-grade teacher complained that her students were hyperactive and unteachable. The classroom levels of high-frequency voltage transients (dirty electricity) in the radio frequencies (RF) between 4 and 100 kHz measured in the outlets of her classroom with a Graham/Stetzer Microsurge meter were very high. Dirty electricity is a term coined by the electrical utilities to describe electrical pollution contaminating the 60 Hz electricity on the electrical grid. A cell phone tower on campus a few feet from this classroom and unshielded fluorescent lights both contributed to the electrical pollution in this room. Cell tower transmitters, like most modern electrical equipment, operate on direct current. The electrical current brought to the tower is alternating current that needs to be changed to direct current. This is done by a switching power supply. These devices interrupt the alternating current and are the likely major source of the dirty electricity in the classroom.

On a Friday afternoon after school, I filtered the 5 outlets in this room with Graham/Stetzer plug-in capacitive filters, reducing the measured dirty electricity in the room wiring from more than 5000 Graham/Stetzer units to less than 50 units. With no change in either the lighting or the cell tower radiation, the teacher reported an immediate dramatic improvement in the behavior of her students in the following week. They were calmer, paid more attention, and were teachable all week except for Wednesday when they spent part of the day in the library.

In his 1973 book, Health and Light,[1] John N. Ott described a 1973 study of 4 first-grade classrooms in a windowless Sarasota, Florida school. Two of the rooms had standard white fluorescent lighting and the other two had full-spectrum fluorescent lighting with a grounded aluminum wire screen to remove the RF radiation produced by fluorescent bulbs and ballasts. Concealed time-lapse cameras recorded student behavior in classrooms for 4 months.[2] In the unshielded rooms, the first graders developed, "... nervous fatigue, irritability, lapses of attention, and hyperactive behavior." "... students could be observed fidgeting to an extreme degree, leaping from their seats, flailing their arms, and paying little attention to their teachers." In the RF-shielded rooms, "Behavior was entirely different. Youngsters were calmer and far more interested in their work."

The Old Order Amish live without electricity. A pediatric group practice in Jasper, Indiana, which cares for more than 800 Amish families has not diagnosed a single child with attention deficit hyperactivity disorder (ADHD).[3] Dozens of cases of childhood ADHD have been "cured" with no further need for drugs by simply changing their electrical environments (Stetzer D, personal communication [www.Stetzerelectric.com]). AQ:A

Before children are treated with drugs for ADHD, the dirty electricity levels in their homes and school environments should first be examined and reduced if needed.

I present the epidemiologic evidence linking dirty electricity to the other diseases of civilization in a recent book.[4,5] AQ:B

Disclosure: The authors declare no conflict of interest. AQ:C

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5. www.sammilham.com

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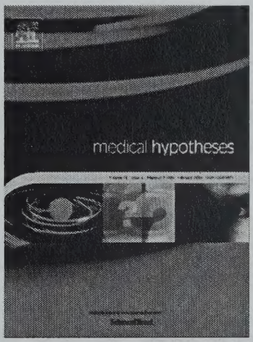

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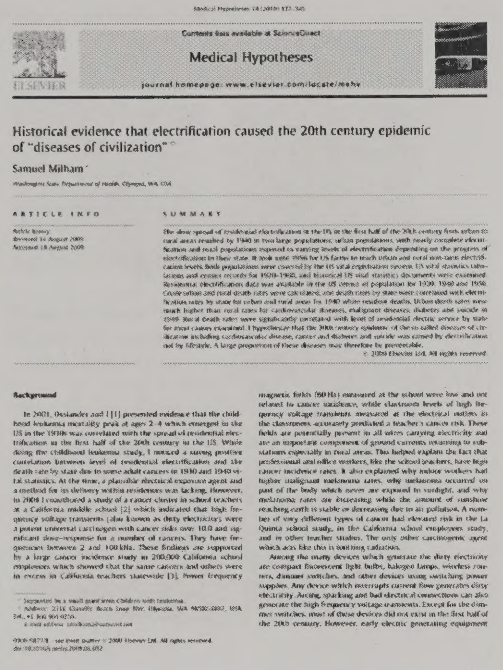

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Historical evidence that electrification caused the 20th century epidemic of "diseases of civilization"

Samuel Milham

Washington State Department of Health, Olympia, WA, USA

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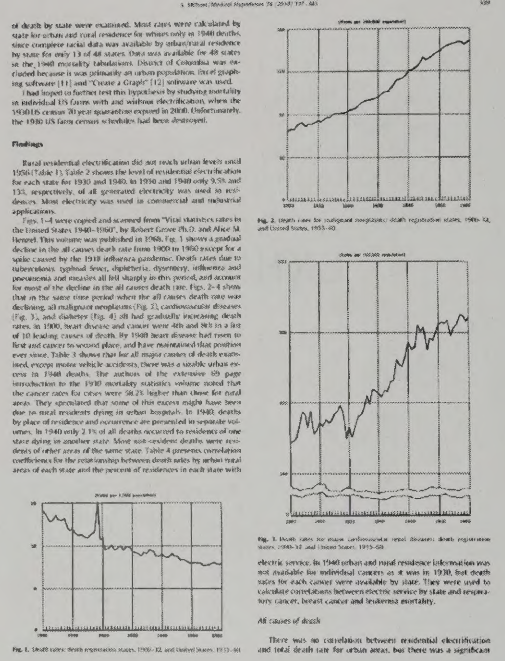

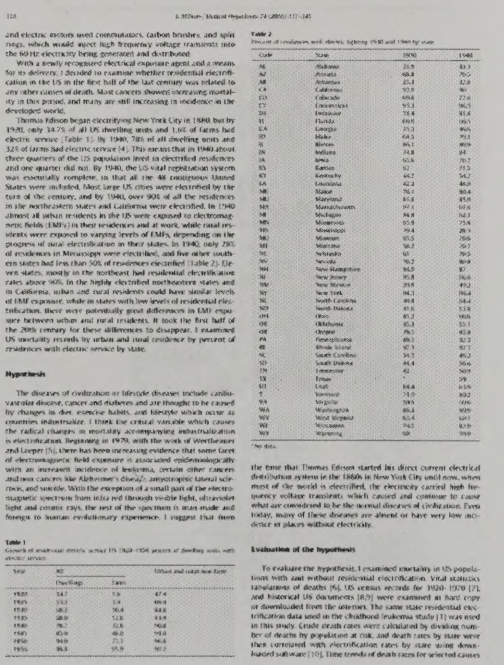

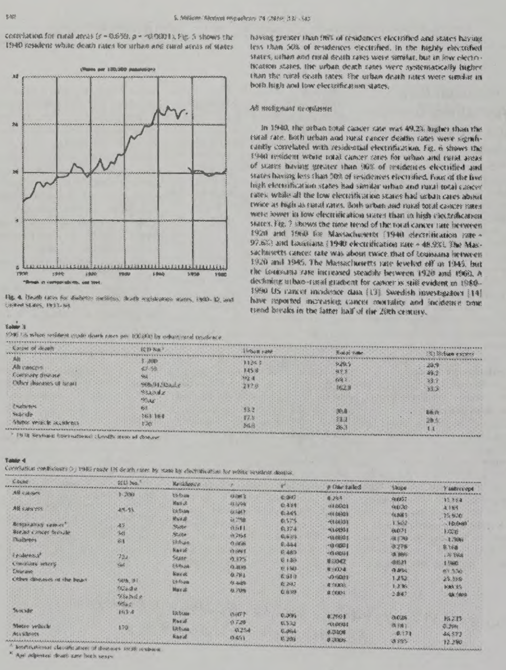

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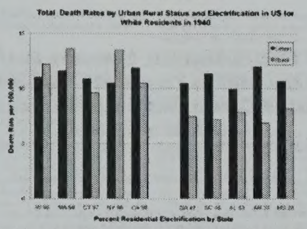

Fig. 5. All-causes death rates by urban rural status and electrification in the US for white residents in 1940.

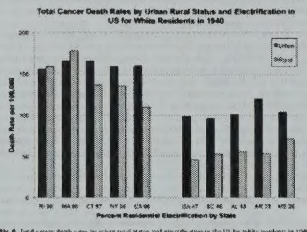

Fig. 6. Total cancer death rates by urban rural status and electrification in the US for white residents in 1940.

Respiratory cancer

No urban rural information was available for respiratory cancer, but the correlation between residential electrification and state death rates was $r = 0.611$; $p = <0.0001$. This cancer is etiologically strongly related to cigarette smoking, so the correlation with electrification is surprising. A large electrical utility worker cohort study found a high respiratory cancer incidence related to high frequency EMF transient exposure independent of cigarette smoking with a significant dose–response relationship [15].

Breast cancer

Although urban/rural information was not available for breast cancer, the 1940 state breast cancer death rates have a correlation of $r = 0.794$; $p = <0.0001$ with residential electrification. Fig. 8 shows the typical time trend of breast cancer death rates for a state with a high level of electrification (96%) and one with a low level of electrification (<50) in 1940. The California breast cancer death rate increased from 1920 to 1940, and then gradually decreased until 1960. The Tennessee breast cancer death rate is less than half of the California rate in 1920 and continues a steady increase until 1960.

Diabetes

This cause has a 66% urban excess. In spite of this, the correlation coefficients for urban and rural areas are similar at $r = 0.60$; $p = <0.0001$. There is some animal and human evidence that EMFs can effect insulin production and blood glucose levels [16]. Fig. 9

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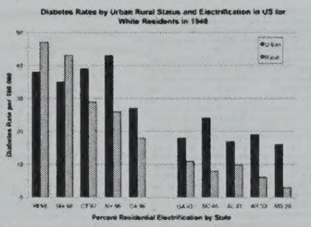

Fig. 9. Total diabetes rates by urban rural status and electrification in the US for white residents in 1940.

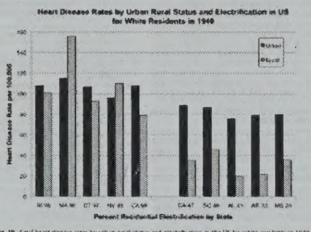

Fig. 10. Total heart disease rates by urban rural status and electrification in the US for white residents in 1940.

urban and rural areas of states having greater than 96% of residences electrified and states having less than 50% of residences electrified. In four of five high electrification states, rural suicide rates are higher than the urban rates. In all of the low electrification states, the urban rate is higher. The rural rates in the high electrification states are higher than the rural rates in the low electrification states. Fig. 12 shows X Y scatter plots for urban and rural suicide by electrification for 48 states. Suicide has been associated with both residential [18] and occupational [19] EMF exposure. Suicide is probably the visible peak of the clinical depression iceberg.

Motor vehicle accidents

Although the mortality rates are similar in urban and rural areas, the correlation with residential electrification levels are different. There is a slight negative correlation ($r = -0.254$) in urban areas and a positive correlation ($r = 0.451$) in rural areas. Since motor vehicle fatality is related to access to a vehicle and to speed, it may be that in the larger cities it was difficult to go fast enough for a fatal accident, and in rural areas especially on farms, a farmer who could afford electrification could also afford a car.

Discussion

When Edison and Tesla opened the Pandora's box of electrification in the 1880s, the US vital registration system was primitive at best, and infectious disease death rates were falling rapidly. City residents had higher mortality rates and shorter life expectancy than rural residents [8]. Rural white males in 1900 had an expectation of life at birth of over 10 years longer than urban residents.

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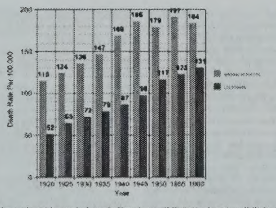

Fig. 7. US white resident total cancer death rates for Massachusetts (97.6% elect.) and Louisiana (48.9% elect.) by year.

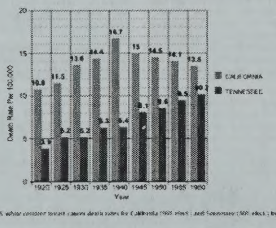

Fig. 8. US white resident breast cancer death rates for California (96% elect.) and Tennessee (50% elect.) by year.

shows that in states with low levels of electrification in 1940, the urban diabetes death rates are consistently higher than the rural rates, but are always lower than the urban and rural rates in the high electrification states.

Leukemia

Since the childhood leukemia age peak is strongly associated with residential electrification, it was interesting that the all leukemia death rate correlation was $r = 0.375$; $p = 0.0042$. Most of these deaths are in adults and are of different types of leukemia. A study of amateur radio operators showed a selective excess only of acute myelogenous leukemia [17].

Coronary artery disease and other heart disease

These two cause groups had the same percentage urban excess (33%), and very similar patterns of urban and rural correlation coefficients with residential electrification. The urban correlations were about $r = 0.4$ and rural deaths had correlations of 0.78 and 0.79, respectively. Fig. 10 shows the 1940 resident white coronary artery disease death rates for urban and rural areas of states having greater than 96% of residences electrified and states having less than 50% of residences electrified. Four of the five high electrification states had similar urban and rural total cancer rates, while all the low electrification states had urban rates about twice as high as rural rates. Urban and rural coronary artery death rates were lower in low electrification states than in high electrification states.

Suicide

The urban suicide death rate is about 30% higher than the rural rate. The urban suicide rate is not correlated with residential electrification ($r = 0.077$; $p = 0.299$), but the rural death rate is correlated with 1940 state residential electrification levels ($r = 0.729$; $p = <0.0001$). Fig. 11 shows the 1940 resident white suicide for

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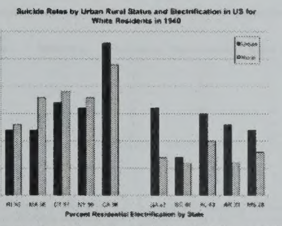

Fig. 11. Total suicide death rates by urban rural status and electrification in the US for white residents in 1940.

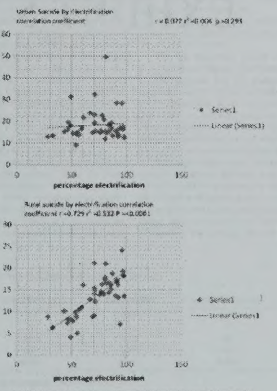

Fig. 12. 1940 US white resident urban rural suicide death rates by state and electrification.

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Although the authors of the 1930 US vital statistics report noted a 58.2% cancer mortality excess in urban areas, it raised no red flags. The census bureau residential electrification data was obviously not linked to the mortality data. Epidemiologists in that era were still concerned with the communicable diseases.

Court Brown and Doll reported [20] the appearance of the childhood leukemia age peak in 1961, forty years after the US vital statistics mortality data on which it was based was available. I reported a cluster of childhood leukemia [21] a decade after it occurred, only because I looked for it. Real time or periodic analysis of national or regional vital statistics data is still only rarely done in the US.

The real surprise in this data set is that cardiovascular disease, diabetes and suicide, as well as cancer seem to be strongly related to level of residential electrification. A community-based epidemiologic study of urban rural differences in coronary heart disease and its risk factors was carried out in the mid 1980s in New Delhi, India and in a rural area 50 km away [22]. The prevalence of coronary heart disease was three times higher in the urban residents, despite the fact that the rural residents smoked more and had higher total caloric and saturated fat intakes. Most cardiovascular disease risk factors were two to three times more common in the urban residents. Rural electrification projects are still being carried out in parts of the rural area which was studied.

It seems unbelievable that mortality differences of this magnitude could go unexplained for over 70 years after they were first reported and 40 years after they were noticed. I think that in the early part of the 20th century nobody was looking for answers. By the time EMF epidemiology got started in 1979 the entire population was exposed to EMFs. Cohort studies were therefore using EMF-exposed population statistics to compute expected values, and case-control studies were comparing more exposed cases to less exposed controls. The mortality from lung cancer in two pack a day smokers is over 20 times that of non-smokers but only three times that of one pack a day smokers. After 1956, the EMF equivalent of a non-smoker ceased to exist in the US. An exception to this is the Amish who live without electricity. Like rural US residents in the 1940s, Amish males in the 1970s had very low cancer and cardiovascular disease mortality rates [23].

If this hypothesis and findings outlined here are even partially true, the explosive recent increase in radiofrequency radiation, and high frequency voltage transients sources, especially in urban areas from cell phones and towers, terrestrial antennas, wi-fi and wi-max systems, broadband internet over power lines, and personal electronic equipment, suggests that like the 20th century EMF epidemic, we may already have a 21st century epidemic of morbidity and mortality underway caused by electromagnetic fields. The good news is that many of these diseases may be preventable by environmental manipulation, if society chooses to.

Conflicts of interest statement

None declared.

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EXHIBIT 5

AMERICAN JOURNAL OF INDUSTRIAL MEDICINE (2008)

A New Electromagnetic Exposure Metric: High Frequency Voltage Transients Associated With Increased Cancer Incidence in Teachers in a California School

Samuel Milham, MD, MPH[1,*] **and L. Lloyd Morgan, BS**[2]

Background *In 2003 the teachers at La Quinta, California middle school complained that they had more cancers than would be expected. A consultant for the school district denied that there was a problem.*
Objectives *To investigate the cancer incidence in the teachers, and its cause.*
Method *We conducted a retrospective study of cancer incidence in the teachers' cohort in relationship to the school's electrical environment.*
Results *Sixteen school teachers in a cohort of 137 teachers hired in 1988 through 2005 were diagnosed with 18 cancers. The observed to expected (O/E) risk ratio for all cancers was 2.78 ($P = 0.000098$), while the O/E risk ratio for malignant melanoma was 9.8 ($P = 0.0008$). Thyroid cancer had a risk ratio of 13.3 ($P = 0.0098$), and uterine cancer had a risk ratio of 9.2 ($P = 0.019$). Sixty Hertz magnetic fields showed no association with cancer incidence. A new exposure metric, high frequency voltage transients, did show a positive correlation to cancer incidence. A cohort cancer incidence analysis of the teacher population showed a positive trend ($P = 7.1 \times 10^{-10}$) of increasing cancer risk with increasing cumulative exposure to high frequency voltage transients on the classroom's electrical wiring measured with a Graham/Stetzer (G/S) meter. The attributable risk of cancer associated with this exposure was 64%. A single year of employment at this school increased a teacher's cancer risk by 21%.*
Conclusion *The cancer incidence in the teachers at this school is unusually high and is strongly associated with high frequency voltage transients, which may be a universal carcinogen, similar to ionizing radiation.* Am. J. Ind. Med. 2008. © 2008 Wiley-Liss, Inc.

KEY WORDS: ***high frequency voltage transients; electricity; dirty power; cancer; school teachers; carcinogen***

BACKGROUND

Since the 1979 Wertheimer–Leeper study [Wertheimer and Leeper, 1979] there has been concern that exposure to power frequency (50/60 Hz) EMFs, especially magnetic fields, may contribute to adverse health effects including cancer. Until now, the most commonly used exposure metric has been the time-weighted average of the power-frequency magnetic field. However, the low risk ratios in most studies suggest that magnetic fields might be a surrogate for a more important metric. In this paper we present evidence that a

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Abbreviations: EMF, electromagnetic fields; O, observed cases; E, expected cases; O/E, risk ratio; P, probability; Hz, Hertz or cycles per second; OSHA, Occupational Safety and Health Administration; OCMAP, occupational mortality analysis program; AM, amplitude modulation; GS units, Graham/Stetzer units; G/S meter, Graham/Stetzer meter; MS II, Microsurge II meter; mG, milligauss; EMS, electromagnetic [illegible]; LQMS, La Quinta Middle School.

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new exposure metric, high frequency voltage transients existing on electrical power wiring, is an important predictor of cancer incidence in an exposed population.

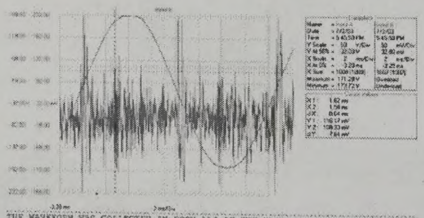
The new metric, GS units, used in this investigation is measured with a Graham/Stetzer meter (G/S meter) also known as a Microsurge II meter (MS II meter), which is plugged into electric outlets [Graham, 2005]. This meter displays the average rate of change of these high frequency voltage transients that exist everywhere on electric power wiring. High frequency voltage transients found on electrical wiring both inside and outside of buildings are caused by an interruption of electrical current flow. The electrical utility industry has referred to these transients as "dirty power."

There are many sources of "dirty power" in today's electrical equipment. Examples of electrical equipment designed to operate with interrupted current flow are light dimmer switches that interrupt the current twice per cycle (120 times/s), power saving compact fluorescent lights that interrupt the current at least 20,000 times/s, halogen lamps, electronic transformers and most electronic equipment manufactured since the mid-1980s that use switching power supplies. Dirty power generated by electrical equipment in a building is distributed throughout the building on the electric wiring. Dirty power generated outside the building enters the building on electric wiring and through ground rods and conductive plumbing, while within buildings, it is usually the result of interrupted current generated by electrical appliances and equipment.

Each interruption of current flow results in a voltage spike described by the equation $V = L \times di/dt$, where V is the voltage, L is the inductance of the electrical wiring circuit and di/dt is the rate of change of the interrupted current. The voltage spike decays in an oscillatory manner. The oscillation frequency is the resonant frequency of the electrical circuit. The G/S meter measures the average magnitude of the rate of change of voltage as a function of time (dV/dT). This preferentially measures the higher frequency transients. The measurements of dV/dT read by the meter are defined as GS (Graham/Stetzer) units.

The bandwidth of the G/S meter is in the frequency range of these decaying oscillations. Figure 1 shows a two-channel oscilloscope display. One channel displays the 60 Hz voltage on an electrical outlet while the other channel with a 10 kHz hi-pass filter between the oscilloscope and the electrical outlet, displays the high frequency voltage transients on the same electrical outlet [Havas and Stetzer, 2004, reproduced with permission].

Although no other published studies have measured high frequency voltage transients and risk of cancer, one study of electric utility workers exposed to transients from pulsed



THE WAVEFORM WAS COLLECTED IN ROOM 114 AT THE ELGIN/MILLVILLE MN HIGH SCHOOL. CHANNEL 1 WAS CONNECTED TO THE 120 VAC UTILITY SUPPLIED POWER RECEPTACLE. CHANNEL 2 WAS CONNECTED TO THE SAME POTENTIAL, EXCEPT THROUGH THE GRAHAM UBIQUITOUS FILTER. (REMOVES THE 60 HERTZ) THE AREA BETWEEN THE CURSORS REPRESENTS A FREQUENCY OF 25 KILO HERTZ. A TEACHER WHO PREVIOUSLY OCCUPIED THE ROOM DIED OF BRAIN TUMORS AND THE TEACHER IN THE ADJOINING ROOM DIED OF LUEKEMIA.

FIGURE 1. Oscilloscope displays of dirty power: 60 Hz electrical power (channel 1) with concurrent high frequency voltage transients (channel 2). A 10 kHz hi-pass filter was used on channel 2 in order to filter out the 60 Hz voltage and its harmonics. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

electromagnetic fields found an increased incidence of lung cancer among exposed workers [Armstrong et al., 1994].

INTRODUCTION

In February 2004, a Palm Springs, California newspaper, The Desert Sun, printed an article titled, "Specialist discounts cancer cluster at school," in which a local tumor registry epidemiologist claimed that there was no cancer cluster or increased cancer incidence at the school [Perrault, 2004]. An Internet search revealed that the teacher population at La Quinta Middle School (LQMS) was too small to generate the 11 teachers with cancer who were reported in the article. The school was opened in 1988 with 20 teachers hired that year. For the first 2 years, the school operated in three temporary buildings, one of which remains. In 1990, a newly constructed school opened. In 2003, the teachers complained to school district management that they believed that they had too many cancers. Repeated requests to the school administration for physical access to the school and for teachers' information were denied. We contacted the teachers, and with their help, the cancers in the group were characterized. One teacher suggested using yearbooks to develop population-at-risk counts for calculating expected cancers. We were anxious to assess the electrical environment at the school, since elevated power frequency magnetic field exposure with a positive correlation between duration of exposure and cancer incidence had been reported in first floor office workers who worked in strong magnetic fields above three basement-mounted 12,000 V transformers [Milham, 1996]. We also wanted to use a new electrical measurement tool, the Graham/Stetzer meter, which measures high frequency voltage transients.

The Graham/Stetzer Microsurge II meter measures the average rate of change of the transients in Graham/Stetzer units (GS units). Anecdotal reports had linked dirty power exposure with a number of illnesses [Havas and Stetzer, 2004]. We decided to investigate whether power frequency magnetic field exposure or dirty power exposure could explain the cancer increase in the school teachers.

METHODS

After the school administration (Desert Sands Unified School District) had refused a number of requests to assist in helping us evaluate the cancers reported by the teachers, we were invited by a teacher to visit the school after hours to make magnetic field and dirty power measurements. During that visit, we noted that, with the exception of one classroom near the electrical service room, the classroom magnetic field levels were uniformly low, but the dirty power levels were very high, giving many overload readings. When we reported this to Dr. Doris Wilson, then the superintendent of schools (retired December, 2007), one of us (SM) was threatened with prosecution for "unlawful.. trespass," and the teacher who had invited us into the school received a letter of reprimand. The teachers then filed a California OSHA complaint which ultimately lead to a thorough measurement of magnetic fields and dirty power levels at the school by the California Department of Health Services which provided the exposure data for this study. They also provided comparison dirty power data from residences and an office building, and expedited tumor registry confirmation of cancer cases.

Classrooms were measured at different times using 3 meters: an FW Bell model 4080 tri-axial Gaussmeter, a Dexsil 310 Gaussmeter, and a Graham-Stetzer (G/S) meter. The Bell meter measures magnetic fields between 25 and 1,000 Hz. The Dexsil meter measures magnetic fields between 30 and 300 Hz. The G/S meter measures the average rate of change of the high frequency voltage transients between 4 and 150 KHz.

All measurements of high frequency voltage transients were made with the G/S meter. This meter was plugged into outlets, and a liquid crystal display was read. All measurements reported were in GS units. The average value was reported where more than one measurement was made in a classroom.

We measured seven classrooms in February 2005 using the Bell meter and the G/S meter. Later in 2005, the teachers measured 37 rooms using the same meters. On June 8, 2006, electrical consultants for the school district and the California Department of Health Services (Dr. Raymond Neutra) repeated the survey using the G/S meter and a Dexsil 320 Gaussmeter, measuring 51 rooms. We used results of this June 8, 2006 sampling in our exposure calculations, since all classrooms were sampled, multiple outlets per room were sampled, and an experienced team did the sampling. Additionally, GS readings were taken at Griffin Elementary school near Olympia, Washington, and Dr. Raymond Neutra provided GS readings for his Richmond California office building and 125 private California residences measured in another Northern California study.

All the cancer case information was developed by personal, telephone, and E-mail contact with the teachers or their families without any assistance from the school district. The local tumor registry verified all the cancer cases with the exception of one case diagnosed out of state and the two cases reported in 2007. The out-of state case was verified by pathologic information provided by the treating hospital. The teachers gathered population-at-risk information (age at hire, year of hire, vital status, date of diagnosis, date of death, and termination year) from yearbooks and from personal contact. The teachers also provided a history of classroom assignments for all teachers from annual classroom assignment rosters (academic years 1990–1991 to 2006–2007) generated by the school administration. The school administration provided a listing of school employees, including the teachers, to the regional tumor registry after the teachers involved the state health agency by submitting an OSHA complaint. The information we obtained anecdotally from the teachers, yearbooks, and classroom assignment rosters was nearly identical to that given to the tumor registry. None of the cancer cases were ascertained initially through the cancer registry search.

Published cancer incidence rates by age, sex, and race for all cancers, as well as for malignant melanoma, thyroid, uterine, breast, colon, ovarian cancers, and non-Hodgkin's lymphoma (NHL) were obtained from a California Cancer Registry publication [Kwong et al., 2001]. We estimated the expected cancer rate for each teacher by applying year, age, sex, and race-specific cancer incidence rates from hire date until June 2007, or until death. We then summed each teacher's expected cancer rate for the total cohort.

Using the California cancer incidence data, the school teacher data, and the GS exposure data, we calculated cancer incidence and risks. A replicate data set was sent to Dr. Gary Marsh and to Mike Cunningham at the University of Pittsburgh School of Public Health for independent analysis using OCMAP software. We calculated cancer risk ratios by duration of employment and by cumulative GS unit-years of exposure. We calculated an attributable risk percent using the frequencies of total observed and expected cancers, and performed trend tests [Breslow and Day, 1987] for cancer risk versus duration of employment and cumulative GS unit-years of exposure. Poisson *P* values were calculated using the Stat Trek website (Stat Trek, 2007). We also performed a linear regression of cancer risk by duration of employment in years and by time-weighted exposure in GS unit-years.

Since neither author had a current institutional affiliation, institutional review board approval was not possible. The teachers requested the study, and their participation in the study was both voluntary and complete. All the active teachers at the school signed the Cal OSHA request. The authors fully explained the nature of the study to study participants and offered no remuneration to the teachers for participation in the study. The authors maintained strict confidentiality of all medical and personal information provided to us by the teachers, and removed personal identifiers from the data set which was analyzed by the University of Pittsburgh. Possession of personal medical information was limited to the two authors. No patient-specific information was obtained from the tumor registry. With the individual's permission we provided the registry with case information for a teacher with malignant melanoma diagnosed out of state. The exposure information was provided by the California Department of Health Services. The basic findings of the study were presented to the Desert Sands Unified School District School Board and at a public meeting arranged by the teachers.

RESULTS

Electrical Measurements

In our seven-room survey of the school in 2005, magnetic field readings were as high as 177 mG in a classroom adjacent to the electrical service room. A number of outlets had overload readings with the G/S meter. Magnetic fields were not elevated (>3.0 mG) in the interior space of any of the classrooms except in the classroom adjacent to the electrical service room, and near classroom electrical appliances such as overhead transparency projectors. There was no association between the risk of cancer and 60 Hz magnetic field exposures in this cohort, since the classroom magnetic field exposures were the same for teachers with and without cancer (results not shown).

This school had very high GS readings and an association between high frequency voltage transient exposure in the teachers and risk of cancer. The G/S meter gives readings in the range from 0 to 1,999 GS units. The case school had 13 of 51 measured rooms with at least one electrical outlet measuring "overload" (≥2,000 GS units). These readings were high compared to another school near Olympia Washington, a Richmond California office building, and private residences in Northern California (Table I). Altogether, 631 rooms were surveyed for this study. Only 17 (2.69%) of the 631 rooms had an "overload" (maximum, >2,000 GS units) reading. Applying this percentage to the 51 rooms surveyed at the case school, we would expect 1.4 rooms at the school to have overload GS readings (0.0269 × 51 = 1.37). However, thirteen rooms (25%) measured at the case school had "overload" measurements above the highest value (1,999 GS units) that the G/S meter can

measure. This is a highly statistically significant excess over expectation (Poisson $P = 3.14 \times 10^{-9}$).

TABLE I. Graham/Stetzer Meter Readings: Median Values in Schools, Homes and an Office Building

Place	Homes	Office bldg	Olympia WA School	LQMS	Total
No. of rooms surveyed	500	39	41	51	631
Median GS units	155	270	160	750	<270[a]
Rooms with overload GS units (≥2,000)	4	0	0	13[b]	17

[a]Excludes homes as specific room data was not available.
[b]$P = 3.14 \times 10^{-9}$.

TABLE II. Risk of Cancer by Type Among Teachers at La Quinta Middle School

Cancer	Observed	Expected	Risk ratio (O/E)	P-value
All cancers	18	6.51	2.78[a]	0.000098
Malignant melanoma	4	0.41	9.76[a]	0.0008
Thyroid cancer	2	0.15	13.3[a]	0.011
Uterus cancer	2	0.22	9.19[a]	0.019
Female breast cancer	2	1.5	1.34	0.24
All cancers less melanoma	14	6.10	2.30[a]	0.0025

[a]$P < 0.05$.

We noticed AM radio interference in the vicinity of the school. A teacher also reported similar radio interference in his classroom and in the field near his ground floor classroom. In May 2007, he reported that 11 of 15 outlets in his classroom overloaded the G/S meter. An AM radio tuned off station is a sensitive detector of dirty power, giving a loud buzzing noise in the presence of dirty power sources even though the AM band is beyond the bandwidth of the G/S meter.

Cancer Incidence

Three more teachers were diagnosed with cancer in 2005 after the first 11 cancer diagnoses were reported, and another former teacher (diagnosed out-of-state in 2000) was reported by a family member employed in the school system. One cancer was diagnosed in 2006 and two more in 2007. In the years 1988–2005, 137 teachers were employed at the school. The 18 cancers in the 16 teachers were: 4 malignant melanomas, 2 female breast cancers, 2 cancers of the thyroid, 2 uterine cancers and one each of Burkitt's lymphoma (a type of non-Hodgkins lymphoma), polycythemia vera, multiple myeloma, leiomyosarcoma and cancer of the colon, pancreas, ovary and larynx. Two teachers had two primary cancers each: malignant melanoma and multiple myeloma, and colon and pancreatic cancer. Four teachers had died of cancer through August 2007. There have been no non-cancer deaths to date.

The teachers' cohort accumulated 1,576 teacher-years of risk between September 1988 and June 2007 based on a 12-month academic year. Average age at hire was 36 years. In 2007, the average age of the cohort was 47.5 years.

When we applied total cancer and specific cancer incidence rates by year, age, sex, race, and adjusted for cohort ageing, we found an estimate of 6.5 expected cancers, 0.41 melanomas, 0.15 thyroid cancers, 0.22 uterine cancers, and 1.5 female breast cancers (Table II). For all cancers, the risk ratio (Observed/Expected = 18/6.5) was 2.78 ($P = 0.000098$, Poisson test); for melanoma, (O/E = 4/0.41) was 9.8 ($P = 0.0008$, Poisson test); for thyroid cancer (O/E = 2/0.15) was 13.3 ($P = 0.0011$, Poisson test); for uterine cancer (O/E = 2/0.22), was 9.19 ($P = 0.019$, Poisson test).

Table III shows the cancer risk among the teachers by duration of employment. Half the teachers worked at the school for less than 3 years (average 1.52 years). The cancer risk increases with duration of employment, as is expected when there is exposure to an occupational carcinogen. The cancer risk ratio rose from 1.7 for less than 3 years, to 2.9 for 3–14 years, to 4.2 for 15+ years of employment. There was a positive trend of increasing cancer incidence with increasing duration of employment ($P = 4.6 \times 10^{-10}$). A single year of employment at this school increases a teacher's risk of cancer by 21%.

TABLE III. Cancer Risk by Duration of Employment

Time at school	Average time	Teachers	% of teachers	Cancer observed	Cancer expected	Risk ratio (O/E)	Poisson p
< 3 years	1.52 years	58	42.6	4	2.34	1.72	0.12
3–14 years	7.48 years	56	40.9	9	3.14	2.87[a]	0.0037
15+ years	16.77 years	12	8.8	5	1.02	4.89[a]	0.0034
Total		137	100	18	6.51	2.78[a]	0.000098

Positive trend test (Chi square with one degree of freedom = 38.8; $P = 4.61 \times 10^{-10}$).
[a]$P < 0.05$.

Using the June 8, 2006 survey data (Table IV), the cancer risk of a teacher having ever worked in a room with at least one outlet with an overload GS reading (≥2000 GS units) and employed for 10 years or more, was 7.1 ($P = 0.00007$, Poisson test). In this group, there were six teachers diagnosed with a total of seven cancers, and four teachers without a cancer diagnosis, who were employed for 10 or more years and who ever worked in one of these rooms. Five teachers had one primary cancer and one teacher had two primary cancers. These teachers made up 7.3% of the teachers' population (10/137) but had 7 cancers or 39% (7/18) of the total cancers. The 10 teachers who worked in an overload classroom for 10 years or more had 7 cancers when 0.99 would have been expected ($P = 6.8 \times 10^{-5}$ Poisson test). The risk ratio for the 8 teachers with cancer and 32 teachers without cancer, who ever worked in a room with an overload GS reading, regardless of the time at the school, was 5.1 ($P = 0.00003$, Poisson test). The risk ratio for 8 teachers with cancer and 89 teachers without cancer who never worked in a room with an overload G-S reading was 1.8 ($P = 0.047$, Poisson test). Teachers who never worked in an overload classroom also had a statistically significantly increased risk of cancer.

TABLE IV. Cancer in Teachers Who Ever Taught in Classrooms With at Least One Overload GS Reading (≥2000 GS Units) by Duration of Employment

Ever in a room >2,000 GS units	Employed 10+ years	Total teachers	Cancers observed	Cancers expected	Risk ratio (O/E)	Poisson p
Yes	Yes	10	7[a]	0.988	7.1[b]	0.00007
Yes	No	30	3[a]	0.939	3.2	0.054
Total		40	10	1.93	5.1[b]	0.00003
No	Yes	10	2	1.28	1.6	0.23
No	No	87	6	3.25	1.8	0.063
Total		97	8	4.56	1.8[b]	0.047
Grand total		137	18	6.49	2.8[b]	0.000098

[a]One teacher had two primary cancers.
[b]$P < 0.05$.

A positive dose-response was seen between the risk of cancer and the cumulative GS exposure (Table V). Three categories of cumulative GS unit-years of exposure were selected: <5,000, 5,000 to 10,000, and more than 10,000 cumulative GS unit-years. We found elevated risk ratios of 2.0, 5.0, and 4.2, respectively, all statistically significant, for each category. There was a positive trend of increasing cancer incidence with increasing cumulative GS unit-years of exposure ($P = 7.1 \times 10^{-10}$). An exposure of 1,000 GS unit-years increased a teacher's cancer risk by 13%. Working in a room with a GS overload (≥2,000 GS units) for 1 year increased cancer risk by 26%.

An attributable risk percentage was calculated: (observed cancers-expected cancers)/observed cancers = (18 − 6.51)/18 = 63.8%.

The fact that these cancer incidence findings were generated by a single day of G/S meter readings made on June 8, 2006 suggests that the readings were fairly constant over time since the school was built in 1990. For example, if the 13 classrooms which overloaded the meter on June 8, 2006 were not the same since the start of the study and constant throughout, the cancer risk of teachers who ever worked in the overload rooms would have been the same as the teachers who never worked in an overload room.

Although teachers with melanoma and cancers of the thyroid, and uterus, had very high, statistically significant risk ratios, there was nothing exceptional about their age at hire, duration of employment, or cumulative GS exposure. However, thyroid cancer and melanoma had relatively short latency times compared to the average latency time for all 18 cancers. The average latency time between start of

TABLE V. Observed and Expected Cancers by Cumulative GS Exposure (GS Unit-Years)

Exposure group	<5,000 GS unit-years	5,000 to 10,000	>10,000 GS unit-years	Total
Average GS unit-years	914	7,807	15,483	
Cancers obs.	9	4	5	18
Cancers exp.	4.507	0.796	1.20	6.49
Risk ratio(O/E)	2.01[a]	5.06[a]	4.17[a]	2.78[a]
Poisson p	0.0229	0.0076	0.0062	0.000098

Positive trend test (Chi square with one degree of freedom = 38.8; $P = 7.1 \times 10^{-10}$).
[a]$P < 0.05$.

employment at the school and diagnosis for all cancers was 9.7 years. The average latency time for thyroid cancer was 3.0 years and for melanoma it was 7.3 years (with three of the four cases diagnosed at 2, 5, and 5 years).

An independent analysis of this data set by the University of Pittsburgh School of Public Health using OCMAP software supported our findings.

DISCUSSION

Because of access denial, we have no information about the source, or characterization of the high frequency voltage transients. We can assume, because the school uses metal conduit to contain the electrical wiring, that any resultant radiated electric fields from these high frequency voltage transients would radiate mainly from the power cords and from electrical equipment using the power cords within a classroom.

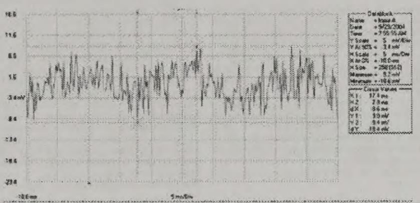
The school's GS readings of high frequency voltage transients are much higher than in other tested places (Table 1). Also, teachers in the case school who were employed for over 10 years and who had ever worked in a room with an overload GS reading had a much higher rate of cancer. They made up 7.3% of the cohort but experienced 39% of all cancers.

The relatively short latency time of melanoma and thyroid cancers suggests that these cancers may be more sensitive to the effects of high frequency voltage transients than the other cancers seen in this population.

In occupational cohort studies, it is very unusual to have a number of different cancers with an increased risk. An exception to this is that cohorts exposed to ionizing radiation show an increased incidence of a number of different cancers. The three cancers in this cohort with significantly elevated incidence, malignant melanoma, thyroid cancer and uterine cancer, also have significantly elevated incidence in the large California school employees cohort [Reynolds et al., 1999]

These cancer risk estimates are probably low because 23 of the 137 members of the cohort remain untraced. Since exposure was calculated based on 7 days a week for a year, this will overstate the actual teachers' exposure of 5 days a week for 9 months a year.

We could not study field exposures in the classrooms since we were denied access to the school. We postulate that the dirty power in the classroom wiring exerted its effect by capacitive coupling which induced electrical currents in the teachers' bodies. The energy that is capacitively coupled to the teachers' bodies is proportional to the frequency. It is this characteristic that highlights the usefulness of the GS meter. High frequency dirty power travels along the electrical distribution system in and between buildings and through the ground. Humans and conducting objects in contact with the ground become part of the circuit. Figure 2 [Havas and Stetzer, 2004, reproduced with permission] shows an oscilloscope tracing taken between EKG patches on the ankles of a man wearing shoes, standing at a kitchen sink. The 60 Hz sine wave is distorted by high frequencies, which allows high frequency currents to oscillate up one leg and down the other between the EKG patches.



The waveform was recorded between 2 EKG patches placed on the ankles of XXXXXX XXXXXXXXX standing in front of his kitchen sink at his home near Bright Ontario. It shows a distorted 60 cycle sine wave containing high frequencies applied to each foot, allowing high frequency current to freely oscillate up one leg and down the other. XXXXXX has been diagnosed with prostrate cancer since moving to the house in less than a year. He was standing with feet shoulder width apart, wearing shoes, at the time of the readings. The amplitude increased as the feet were placed farther apart.

FIGURE 2. Oscilloscope display of 60 Hz current distorted with high frequencies, taken between EKG patches applied to the ankles of a man standing with shoes on at a kitchen sink. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

Although not demonstrated in this data set, dirty power levels are usually higher in environments with high levels of 60 Hz magnetic fields. Many of the electronic devices which generate magnetic fields also inject dirty power into the utility wiring. Magnetic fields may, therefore, be a surrogate for dirty power exposures. In future studies of the EMF-cancer association, dirty power levels should be studied along with magnetic fields.

The question of cancer incidence in students who attended La Quinta Middle School for 3 years has not been addressed.

CONCLUSION

The cancer incidence in the teachers at this school is unusually high and is strongly associated with exposure to high frequency voltage transients. In the 28 years since electromagnetic fields (EMFs) were first associated with cancer, a number of exposure metrics have been suggested. If our findings are substantiated, high frequency voltage transients are a new and important exposure metric and a possible universal human carcinogen similar to ionizing radiation.

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EXHIBIT 6

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

In the Matter of the Application of San Diego Gas & Electric Company (U 902-E) for a Certificate of Public Convenience and Necessity for the Sunrise Powerlink Transmission Project	Application 06-08-010 (Filed August 4, 2006)

PHASE II DIRECT TESTIMONY OF TRAVIS LONGCORE ON BEHALF OF THE CENTER FOR BIOLOGICAL DIVERSITY AND THE SIERRA CLUB

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TESTIMONY OF TRAVIS LONGCORE, PH.D.

My name is Travis Longcore. I have been retained to provide written and oral testimony on the biological impacts of the proposed Sunrise Powerlink Transmission Project with special emphasis on avian collision and electrocution and other impacts to birds. I am currently Research Assistant Professor of Geography at the University of Southern California Center for Sustainable Cities where I am Director of Urban Ecological Research. I am also Science Director of The Urban Wildlands Group, a Los Angeles-based conservation nonprofit. I have taught for seven years at UCLA for the Department of Geography, Institute of the Environment, and Department of Ecology and Evolutionary Biology. Courses taught include Environmental Impact Assessment, Bioresource Management, Ecology, and Field Ecology.

For the past ten years I have consulted on land use issues, providing expert opinion on the compliance of proposed projects with various laws, including the California Environmental Quality Act, National Environmental Policy Act, California Coastal Act, Endangered Species Act, and Migratory Bird Treaty Act. In this capacity I have reviewed dozens of environmental reports and evaluated the quality of their biological resources analysis. I have expertise in the scientific literature describing avian collisions with structures, particularly with lighted communication towers, but also with wind turbines and other structures. Further information about my background can be found in the attached curriculum vitae.

This testimony is based on the Draft Environmental Impact Report/Environmental Impact Statement and Proposed Land Use Plan Amendment ("DEIR/EIS"), peer-reviewed scientific articles that are cited herein, assumptions predicated on these sources, and expert opinion supported by these facts and assumptions.

Collision Impacts

The DEIR/EIS does not provide adequate data to describe and mitigate the impacts resulting from avian collisions with the proposed power transmission lines. Guidance for identifying and mitigating impacts from collisions is available (APLIC 1994) and the DEIR/EIS claims that the project will follow these guidelines in designing and siting towers. "The applicant shall install the transmission lines utilizing Avian Power Line Interaction Committee standards for collision-reducing techniques as outlined in 'Mitigating Bird Collisions with Power Lines: The State of the Art in 1994'" (p. D.2-147). APLIC is a well-respected utility-supported organization that is run by the Edison Electric Institute, which is the research arm of the utilities. The authors of the APLIC guidelines include a U.S. Fish and Wildlife Service biologist, a respected ornithologist from Clemson University, and a retired electrical engineer from a utility company (APLIC 1994). They received input from a broad range of electric utility companies and the resulting guidelines are widely accepted by the industry. A comparison of these guidelines and the DEIR/EIS reveals, however, that these techniques have not been utilized in the siting and design of towers for this project.

It deserves mention that avian collisions with power lines can be reduced through tower design and siting decisions, but collisions cannot be eliminated (Alonso et al. 1994; Brown and Drewien 1995; Janss and Ferrer 1998). Even a single tower can kill many birds in a single night under adverse conditions, as was shown by a 100-foot unlighted communication tower on a ridge in West Virgina that killed 75 birds in a single night (Wylie 1977). This type of blind collision can occur during the day as well (Emerson 1904; Bevanger 1998; Janss 2000). Even after following all possible mitigation measures currently available, avian collisions will continue to occur with power lines. For this reason, site planning is critically important to minimize impacts of new routes. As summarized by Janss (2000), "Because mitigation measures only reduce collision mortality, but do not solve it, adequate route planning of power lines is especially important."

APLIC (1994) provides the following guidance on route planning:

- Keep lines distant from areas where birds are taking off or landing (e.g., wetlands).
- Keep lines below the height of vegetation (in forests).
- Avoid topographic features that concentrate migratory birds (e.g., mountain passes, river valleys).
- Orient lines parallel to primary flight patterns.
- Minimize the horizontal distribution of lines by placing them all at the same height rather than stacked at different heights. This is especially important because the majority of collisions occur with the overhead ground wire, which is typically smaller than other wires and virtually invisible to birds in flight.

Obviously a certain amount of field reconnaissance is necessary to gather the information needed to follow these guidelines. APLIC (1994) provides an entire chapter describing methods to observe birds in power line corridors and to evaluate the presence of birds for potential new corridors. They conclude:

> "All items that could affect the success of the project must be considered and evaluated before the line is built. In general, the purpose of preconstruction studies is to obtain information on bird flight altitudes, directions of flight, intensity of movement, species composition, and temporal variations in flight activity in and about the corridor. Day-time and night-time observations should be made by individuals who can identify birds correctly and gather quantitative data in a systematic fashion" (APLIC 1994).

The DEIR/EIS, despite claiming to follow the APLIC guidelines as part of mitigation measure B-10a, does not show any evidence that project applicants have done so in planning the route and designing the towers.

Some effort is made in the DEIR/EIS to identify migratory pathways for birds. These pathways are shown on several figures (D.2-1, D.2-2, D.2-3). The source given for these pathways is two email communications between a staff member at the San Diego Natural History Museum and consultants for the proposed project (p. D.2-540). The applicant has an obligation under the APLIC guidelines to collect data regarding the distribution, behavior, species composition, and collision susceptibility of the birds that will encounter all portions of the proposed project. Unfortunately, the DEIR/EIS incorrectly claims that it is not possible to know how many birds or what species might be impacted by the proposed projects (D.2-146 and repeated several times thereafter). To the contrary, the APLIC guidelines identify many techniques to evaluate the bird use of areas in route planning. These include: daytime and nighttime visual observation using tools to measure distance and altitude of birds (clinometers and theodolites), closed circuit television recordings, night vision tools such as image intensifiers, forward looking infra-red devices, and radar. In fact, radar techniques were developed to detect birds specifically to evaluate the risk of new transmission lines in 1978 (Korschgen et al. 1984). These tools can be used to develop a reasonable assessment of the quantity and general species composition of birds that might be at risk of collision. Examples of such efforts are available in the published literature. Williams et al. (2001) used radar, visual observations, and a ceilometer to describe birds migrating through a mountain pass. Mabee and colleagues have described bird numbers and altitude of flight using radar at proposed wind power sites (Mabee and Cooper 2004; Mabee et al. 2006). Others have used nocturnal flight calls to identify passing migrants (Farnsworth et al. 2004; Farnsworth and Russell 2007).

It is common for energy projects that may impact migratory birds to include detailed studies of bird migration using a combination of visual observation and radar investigation as part of the environmental review process. The APLIC guidelines cite three such examples (James 1980; McKernan et al. 1982; Gauthreaux 1991). A cursory Internet search reveals many other examples of pre-construction monitoring of birds for potential impacts, including reference to a study of "bird migration in relationship to a proposed powerline and proposed mitigation" by the Golden Valley Electric Association in Alaska, and numerous studies of risk to birds from wind power projects (Mabee and Cooper 2004; Mabee et al. 2006). There are consulting firms that specialize in such studies, offering services such as "monitor rates of nocturnal and diurnal bird migration/movements" and "identify migration and movement corridors for birds" (www.abrinc.com). For projects with potential impacts from avian collision, fieldwork using radar and other techniques is common (Korschgen et al. 1984; Cooper et al. 1991; Harmata et al. 1999; Deng and Frederick 2001; Gauthreaux and Belser 2003; Mabee and Cooper 2004; Mabee et al. 2006).

Although the DEIR/EIS should rely on data gathered in the field at proposed transmission line sites to assess the collision risk of potential structures, it is remarkable that the DEIR/EIS contains no data from San Diego Gas & Electric regarding collisions (or electrocutions) of birds at existing high voltage transmission lines. Given the environmentally oriented operating procedures described in the DEIR/EIS, it would seem that SDG&E personnel would have collected data regarding collision events (incidental observations made by maintenance staff) or electrocution events resulting in power outages. Other utilities collect such data, especially on electrocutions, because they result in service interruptions (APLIC 1994, 2006). Although such data are rarely collected by systematic surveys, they would at least give an indication of the patterns of species vulnerability to collision and electrocution in the project area at existing transmission lines.

Absent data from original studies or incidental observations from SDG&E at existing lines, potential mortality and vulnerable species must be discerned from the scientific literature. Although most migrants travel at altitudes greater than the tops of the proposed towers (Able 1970; Bellrose 1971), a certain proportion of migrants is found nearer the ground, especially during inclement weather or daytime migration (APLIC 1994). Mabee and Cooper (2004) found that at two locations in Oregon, 12–14% of spring migrants were flying below 100 m (328 feet). For a fall migration in West Virginia, 12.7% of birds flew below 100 m (Mabee et al. 2006). These studies show that at given times birds are migrating at an altitude where they could collide with powerlines (e.g., below 100 m).

Ornithologists have identified characteristics that make certain bird species especially vulnerable to collisions (Bevanger 1994; Savereno et al. 1996; Bevanger 1998; Janss 2000). Rails, coots, and cranes (Gruiformes) are most frequently recorded birds killed at powerlines (Bevanger 1998). Other groups at risk include waterbirds and diving birds such as ducks (Anseriformes) and loons (Gaviformes), which also have high "wing loading," which means that their wings are small relative to their weight (Bevanger 1998). These species are unable to maneuver to avoid powerlines, especially in low visibility conditions. Many shorebirds (Scolopacidae) are collision victims, partially because they encounter many lines in their long migratory routes (Bevanger 1998). Aerial predators, such as swifts, many raptors, and even gulls, are at risk because they spend so much time in flight that they have an increased probability of colliding with wires than other species that fly less (Bevanger 1998; Janss 2000).

Collision mortality is of particular concern for species that are in decline (Bevanger 1998; Janss 2000). Usually such species are identified as "sensitive" or are formally listed as threatened or endangered species. For those bird species identified as sensitive in the DEIR/EIS, many fall into groups that are susceptible to collision with power lines. These include the raptors (Cooper's hawk, golden eagle, long-eared owl, ferruginous hawk, Swainson's hawk, northern harrier, white-tailed kite, prairie falcon, bald eagle), common loon, greater sandhill crane, least bittern, and long-billed curlew. Also at risk are all smaller migratory species, which are killed in collisions but are much more difficult to locate under wires than larger species.

The DEIR/EIS fails to recognize the hazard posed to resident and migratory birds of the Salton Sea and the agricultural fields to the south of it. The proposed northern route would pass along and through the western edge of the agricultural zone and within two miles of the Salton Sea itself. The agricultural fields are even more important than the Salton Sea itself to many wading birds (cattle egret, white-faced ibis, sandhill crane) and shorebirds (mountain plover, whimbrel, long-billed curlew) (Shuford et al. 2002), yet the DEIR/EIS does not recognize the increased risk of mortality posed by a new transmission line through this essential habitat. Furthermore, the DEIR/EIS does not identify the risk of constructing a power line across San Felipe Creek, less than 1.5 miles from wetland habitats on the southwestern edge of the Salton Sea. This area is identified as supporting particular concentrations of colonial waterbirds (Shuford et al. 2002). Because of the proximity to wetland habitats associated with the Salton Sea and the rather extensive marsh and stream habitats along San Felipe Creek and San Sebastian Marsh, birds can be expected to move between the Salton Sea and the San Sebastian Marsh. These will include members of the very groups of birds that are at high risk of collision with power lines. Indeed, the earliest records of power line mortalities are derived from exactly this situation, where power lines are located between and adjacent to wetland habitats (Emerson 1904).

The DEIR/EIS should consider impacts to sensitive bird species at the Salton Sea from collision with the Imperial Valley Link (Table 1). These species have morphological characteristics that predispose them to collisions with power lines (Bevanger 1998; Janss 2000) and the DEIR/EIS fails to identify many of them as being impacted by the proposed power line.

Table 1. Sensitive species associated with Salton Sea and agricultural lands (Shuford et al. 2002) that are vulnerable to collision with power lines (Emerson 1904; McNeil et al. 1985; Bevanger 1998; Janss 2000). Status is indicated as California Bird Species of Special Concern (BSSC), federal Birds of Conservation Concern (BCC), and listing status under state and federal endangered species acts.

Species	Status
brown pelican	Federally endangered
American white pelican	California BSSC, Federal BCC
American bittern	Federal BCC
least bittern	California BSSC, Federal BCC
greater sandhill crane	California threatened, Fully Protected Species
lesser sandhill crane	California BSSC
white-faced ibis	Federal BCC
wood stork	California BSSC
fulvous whistling-duck	California BSSC
black rail	California Threatened, Federal BCC
Yuma clapper rail	Federal Endangered
greater sandhill crane	State Threatened, Fully Protected Species
long-billed curlew	Federal BCC

Collision with power lines is the principal cause of death for sandhill cranes (California Department of Fish and Game 1994), which are threatened and fully protected species in California. Collisions occur during migration and when power lines are found in feeding areas (Krapu et al. 1984; Windingstad 1988). The construction of major power lines within known feeding areas south of the Salton Sea would constitute a significant impact to sandhill cranes, which the DEIR/EIS overlooks entirely.

Part of the risk to waterfowl from power lines is that waterfowl rarely fly under power lines but rather attempt to gain altitude and fly over them (Morkill and Anderson 1991). This makes them vulnerable, especially when they see transmission lines and gain altitude, only to collide with the nearly invisible ground wire above the energized lines (Morkill and Anderson 1991). Marking ground wires is consequently a common mitigation technique (APLIC 1994; Brown and Drewien 1995; Janss and Ferrer 1998).

The proposed aboveground transmission line routes would be a permanent hazard to resident and migratory birds. Far greater field data must be conducted to describe this risk, but it is probably significant in most of the undeveloped regions of the project area. The proposed project design, as far as it is revealed in the DEIR/EIS, does not minimize those impacts, nor does it follow the APLIC recommendations to do so.

1. *Keep lines distant from areas where birds take off or land.* The Imperial Valley Link cuts through habitat highly utilized by wintering birds (agricultural lands) and between wetland habitats. The Anza-Borrego Link, Central Link, and Inland Valley Link traverse habitats where dense populations of birds live and through which many species migrate. No mitigation for the Imperial Valley Link is even proposed.

2. *Keep lines below the height of vegetation.* This minimization measure is not available for the proposed project because the vegetation types through which the lines would pass are not forested.
3. *Avoid topographic features that concentrate migratory birds.* Although the proposed routes do not follow ridgelines, they do follow valley floors, which can also concentrate migrants. Furthermore, no data were collected to describe the movement of birds across the various project areas so no conclusions can be reached whether migratory pathways have been avoided.
4. *Orient lines parallel to primary flight patterns.* No studies were conducted to determine those flight patterns, but the extent of the project guarantees that this recommendation cannot be followed throughout.
5. *Minimize horizontal distribution of lines.* The proposed project fails to follow this recommendation. The 500 kV tower design includes two ground wires at the top of the tower with the main circuits hanging below. In areas with the 69/92 kV underbuild the towers include three heights of wires spread over 60–70 feet (Figure B-19). All of the steel pole towers show circuits at several heights (B-16 to B-18) rather than at the same height. None of these designs are consistent with the APLIC (1994) recommendations because they spread the wires over a vertical area of 60–80 feet. If all cables were to be at one level, one change in altitude would allow birds to avoid them (Janss 2000). The current designs therefore do not minimize collision risk to birds.

Mitigation Measure B-10a further suggests the use of diversion devices for a portion of the project in the Imperial Valley and Anza-Borrego links. Diversion devices can reduce mortality of birds by 50% and sometimes 75% (Morkill and Anderson 1991; Alonso et al. 1994; Brown and Drewien 1995; Janss and Ferrer 1998). Such a reduction is an improvement, but certainly does not represent reduction of the significant impact to a less than significant level given the miles of lines to be installed and the vulnerable species known to live and migrate near these lines. Appropriate studies of these transmission corridors following the APLIC (1994) guidelines would allow for an adequate description of additional risk to birds from collisions with the proposed lines but these studies have not been conducted. Sufficient data are not presented in the DEIR/EIS to support the claim that impacts to birds from collision with the proposed transmission lines would be mitigated to a less than significant level and indeed, collisions could result in take of federal and state protected species.

Electrocution Impacts

Electrocution by power lines is a significant source of mortality for some bird species to the extent that population density and distribution is altered (Sergio et al. 2004). The DEIR/EIS describes a project that will consist of large transmission lines, while most mortality from electrocution derives from smaller distribution lines where the separation between wires is smaller (Lehman 2001; APLIC 2006). The proposed project also involves relocation of a 69 kV distribution line along the Central Link of the project (p. D.2-144). Although the DEIR/EIS argues that the electrocution risk will be the same as before, this relocation makes the relocated distribution line part of the project and therefore impacts must be identified, minimized, and mitigated. The project also does not fully account for the collision risk posed by the 69 or 92 kV underbuilds along several project links. The depictions of such structures (Figure B-19) do not provide measurements of the distances between the energized conductors and between the innermost conductor and the steel structure. The renderings are apparently not to scale, but it seems possible that the underbuild lines might be close enough to allow for electrocution of birds.

The DEIR/EIS does not discuss the potential of "streamers" to cause flashovers on power lines. "Streamers" are long streams of bird excrement that can span energized conductors and other line structures. A flashover is a fault that originates on the energized conductor and travels through the streamer to the structure (APLIC 2006). These may cause power outages and occasionally bird mortalities (APLIC 2006). The DEIR/EIS should discuss this potential problem relative to the tower designs proposed for the project.

Transmission Towers as Perches

The construction of transmission towers across areas that have few natural perches can dramatically alter the distribution of raptors and ravens (Knight and Kawashima 1993; Knight et al. 1993). For example, a study of raptor habitat use and density following construction of a 230 kV transmission line with 75-foot towers across open prairie in Colorado showed a significant increase in raptor density within 1,300 feet (0.4 km) of the towers (Stahlecker 1978), essentially changing the distribution of raptors across the landscape. Although towers were 1.5% of the available perches, they accounted for 81% of raptor perch sites (Stahlecker 1978). Such artificial concentration of predaceous species by power lines has been confirmed in other studies (Knight and Kawashima 1993) can have adverse impacts on prey species (Lammers and Collopy 2007).

The DEIR/EIS acknowledges that transmission towers would provide additional nest sites for red-tailed hawks but asserts that the number of red-tailed hawks would be controlled by prey availability (p. D.2-148). This argument does not, however, account for the altered distribution of raptors within the landscape that results from transmission tower construction (Stahlecker 1978). This impact is in fact significant because of the concentration of predator activity in certain areas and its effects on sensitive species. The DEIR/EIS offers no mitigation for this impact.

The mitigation proposed for increased density of ravens associated with transmission towers is to develop a raven control plan for Anza-Borrego State Park and in habitat for desert tortoise and flat-tailed horned lizard (MM B-11a, b). Ongoing lethal control of ravens, as implied by the text of the mitigation measure, is far less desirable than avoiding such impacts. Undergrounding lines along existing roads would avoid this impact entirely.

Noise

The analysis in the DEIR/EIS of the impacts of increased noise from construction and operations on sensitive bird species relies on the faulty assumption that they are not affected by noise levels less than 60 dB(A). The DEIR/EIS applies this standard to least Bell's vireo, southwestern willow flycatcher, California gnatcatcher, and other species. Least Bell's vireo was located along the proposed route in the Anza Borrego Link (Yaqui Well) and Central Link (assumed present at MP 101), while southwestern willow flycatcher is assumed present along the Central Link (MP

101). These species were located or assumed present along several of the alternative routes as well.

The 60 dB(A) threshold for impacts on avian species was established in 1991 by a study conducted for the San Diego Association of Governments in which "it was theoretically estimated that noise levels in excess of 60 dB(A) Leq in [Least Bell's] vireo habitat would mask the bird's song, subsequently reducing the reproductive success of this species during their breeding season…." (County of San Diego 2000). This study, on which the U.S. Fish and Wildlife Service apparently based its acceptance of the 60 dB(A) threshold as well, to our knowledge has never been published or peer reviewed. The DEIR/EIS refers to Bowles and Wisdom (2005) as a source for the standard but this published abstract of a conference paper questions, and does not support, the use of the 60 dB(A) standard.

Since 1991, scientific understanding of the effects of noise on birds has improved greatly, with studies published that present heuristic and mathematical models that quantify the pattern of impacts caused by noise (Hill 1990; Reijnen and Foppen 1994; Reijnen et al. 1996; Reijnen et al. 1997; Forman et al. 2002; Peris and Pescador 2004; Slabbekoorn and Ripmeester 2008). Rather than relying on undocumented research nearly two decades old, it is incumbent upon the applicant to incorporate the best and most up-to-date scientific evidence of the impacts of noise on breeding birds in the environmental analysis of the proposed project.

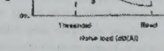

Figure 1. Threshold model for relative breeding density of birds plotted against traffic noise, where T is the threshold value and R the value at the roadside [or other noise source]. The decrease factor of the density = area of A/(area of A + B). Caption and figure reproduced from Reijnen et al. (1995).

In the late 1990s, a group of Dutch ecologists investigated the effects of traffic noise on breeding bird density. Of 45 bird species investigated in woodlands in The Netherlands, 33 showed significantly depressed breeding density near roads. All species in the small passerine families Sylviidae, Fringillidae, and Emberizidae were affected by noise (Reijnen et al. 1997). This research also showed that noise effects followed a threshold model (Reijnen et al. 1995). This means that up to a certain noise level, no decrease in density is observed. When noise increases beyond that threshold level, bird density decreases dramatically in the area between the location at which that threshold is met and the road (Figure 1). The decreased density over the area with noise greater than the threshold level ranges from 30% to 100% and is known as the "decrease factor" (Reijnen and Foppen 1995; Reijnen et al. 1995). These two variables, the threshold and the decrease factor, describe the impact of road noise on breeding birds. Empirical measurement of the threshold value in woodlands shows that for all bird species combined the threshold value is 42-52 dB(A), with individual species exhibiting thresholds as low as 36 dB(A) and as high as 58 dB(A) (Reijnen and Foppen 1995; Reijnen et al. 1995). Furthermore, years with overall low population densities showed lower threshold levels. This information can be used to evaluate the impacts of noise from the proposed project from construction, maintenance, and operation (corona noise).

The least Bell's vireo and southwestern willow flycatcher are small songbirds that rely on hearing songs to attract mates and defend territories. Habitat for both species would be impacted by noise from the proposed project (Figs. Ap8C-06, Ap8C-10). The studies of road noise from Europe include similar small songbirds that use acoustical communication. The threshold levels for two European warbler species (*Phylloscopus sibilatrix* and *Phylloscopus trochilus*) are 26 dB(A) and 39 dB(A), with decrease factors of 0.61 and 0.38, meaning breeding density was diminished to ~40–60% of undisturbed levels (Reijnen et al. 1995). From the published literature, therefore, a reasonable threshold based on similar species for least Bell's vireo and southwestern willow flycatcher would be 40 dB(A) or below. Data from California support this conclusion. In 1999, Haas recorded sound levels (one hour A-weighted Leq) at 87 locations in the vicinity of the southwestern willow flycatcher colony along the San Luis Rey River in the vicinity of the Lake Henshaw Dam. The study site harbors the most robust and stable southwestern willow flycatcher colony in California. Sampling locations were established along the river; 100 meters (the approximate average length of a southwestern willow flycatcher territory within the colony) separated each location. The territories were nearly identical in all habitat characteristics except sound level. Of these territories, 44 were occupied by either a pair of flycatchers (n = 42) with a nest, a solitary male (n = 1), or a solitary female (n = 1). Using sound as the independent variable, and occupancy as the response variable, I completed a logistic regression on these data. The results were highly significant ($p < 0.0001$, $r^2 = 0.49$), indicating with certainty that territory occupancy is reduced by sound levels in the 50–60 dB(A) range.

A conclusion that noise impacts on sensitive bird species such as southwestern willow flycatcher and least Bell's vireo start below 50 dB(A) is robust. Thresholds for other bird species have been determined to be in the 40–50 dB(A) range (Reijnen et al. 1997). The 60 dB(A) threshold currently used by the DEIR/EIS will be ineffective at eliminating noise impacts, and in fact noise at the 50–60 dB(A) level could deter breeding activity altogether for some species. According to the DEIR/EIS, corona noise from the 500 kV transmission line would increase ambient noise levels within the project right of way to 52 dB(A) along a number of project links under certain weather conditions (Table D.8-13). Noise from construction and maintenance activities would also increase noise levels for sensitive bird species. These impacts should be evaluated with a lower threshold that is based on the published scientific literature rather than the unsubstantiated 60 dB(A) threshold.

Helicopter Disturbance

The DEIR/EIS discloses that 111 towers will be built using helicopters to deliver materials (p. B-84) and furthermore describes complete inspection of the system using helicopters on at least an annual basis (p. D.2-149). Yet the DEIR/EIS only describes helicopter disturbance within the context of impacts to Peninsula bighorn sheep (p. D.2-114). The DEIR/EIS gives no limits to the frequency of helicopter flyovers for the lines (p. D.8-18). Many other wildlife groups are affected by helicopter disturbance than bighorn sheep (Efroymson and Suter 2001), and the DEIR/EIS does not contain a complete discussion of the impacts of helicopter disturbance on these groups. Efroymson and Suter (2001) summarized the literature on the effects of military overflights on wildlife and found thresholds for impacts to wildlife from rotary-wing aircraft for raptors, waterfowl, and ungulates. For example, flights within 15 km can disturb waterfowl,

which only sometimes become habituated to such disturbance (Efroymson and Suter 2001). Raptors can similarly be disturbed and while some species can become habituated (such as red-tailed hawks, which are known for habituating to human activity) other species may abandon an area that has been disturbed by helicopter overflights (Andersen et al. 1989). The DEIR/EIS uses a mitigation approach for golden eagles that limits disturbance from helicopters (and other noise sources) to the period outside of breeding season when within 4,000 feet of a nest site (Mitigation Measure B-7b). This measure is not sufficient to protect golden eagles from adverse impacts. Scientific literature on this subject is clear, "The presence of humans detected by a raptor in its nesting or hunting habitat can be a significant habitat-altering disturbance even if the human is far from an active nest" (Richardson and Miller 1997). Regardless of distance, a straightline view of disturbance affects raptors, and an effective approach to mitigate impacts of disturbance for golden eagles involved calculation of viewsheds using a three-dimensional GIS tool and development of buffers based on this (Camp et al. 1997, Richardson and Miller 1997). The DEIR/EIS assumes that impacts to golden eagles can be avoided by a 4,000-foot buffer from nest sites, but this approach will not avoid disturbance to hunting habitat or line-of-sight impacts from nest sites, regardless of distance. Helicopters will be a chronic intrusion into areas that currently have no such artificial disturbance.

Electromagnetic Fields

The DEIR/EIS contains an electromagnetic field (EMF) management plan, but places undeveloped land as the lowest priority for implementation of low-cost measures to reduce EMFs (Appendix 7, p. 6). This approach ignores the adverse impacts of EMFs on wildlife that have been documented in the scientific literature.

Birds are closely associated with powerlines through perching, nesting on supporting structures, and exposure to EMFs in habitats below and adjacent to lines (Fernie and Reynolds 2005). An experimental study exposed America kestrel (a raptor found along the project route) to electromagnetic fields equivalent to being under a 735 kV transmission line (Fernie et al. 2000). The pairs exposed to EMFs had higher fertility but poorer hatching success (Fernie et al. 2000). Behavior was affected as well, with pairs exposed to EMFs maintaining higher activity levels.

Such activity is not desirable during nesting when reductions in activity levels are associated with egg-laying and protection of eggs (Fernie and Reynolds 2005).

A German study showed increased egg size in one species nesting under a 100 kV power line, decreased egg size in another species, and no difference in two other species (reported in Fernie and Reynolds 2005). A review of studies of embryonic development found that most studies (88%) found adverse effects resulting from exposure to EMFs similar to that experienced by nesting under power lines (Fernie and Reynolds 2005). Exposure to EMFs also has been shown to inhibit production of the hormone melatonin, which helps to regulate seasonal behaviors such as nesting, molt, and migration (Fernie et al. 1999). Even though relatively few studies of the effects of EMFs on birds have been completed, "much of the research has found that EMF exposure has generally affected birds, and most of the effects have been adverse" (Fernie and Reynolds 2005). The DEIR/EIS errs in failing to consider the impacts of EMFs on birds and other wildlife and consequently fails to identify significant adverse impacts to bird habitat across the aboveground portions of the proposed transmission line.

Fragmentation Impacts

The proposed project will have impacts to native ecosystems that extend well beyond the footprint of the transmission towers and associated road infrastructure. These impacts are not adequately described in the DEIR/EIS. One such mechanism is through "bottom-up" effects whereby invertebrate communities are disrupted, which then affects other wildlife. Disturbance of natural scrub and chaparral communities will promote the invasion of alien insect species, such as the Argentine ant (*Linepithema humile*). The deleterious effect of Argentine ants on native arthropods is well documented; many studies report a decrease in arthropod diversity as Argentine ant abundance increases (Erickson 1971, Cole 1983, Human and Gordon 1996, 1997, Holway 1998a, Kennedy 1998). The proposed project will promote invasion of Argentine ants by providing two conditions that increase invasion: a water source (Holway 1998b; Human et al. 1998; Holway and Suarez 2006) and increased disturbance (Human et al. 1998). These are provided in the form of watering for dust suppression (D.2-165), washing of insulators on towers (B-98), and by construction and maintenance activities. Argentine ants invade far beyond disturbed areas and water sources and into surrounding undisturbed habitats, with increased abundance documented to a distance of up to 650 feet (Suarez et al. 1998).

The proposed project will also involve destruction of habitat as part of the fuels management program (p. D.15-64). Community level analysis indicates that arthropod species composition will change and overall diversity will decrease when native habitats are subjected to fuel modification. Disturbed coastal sage scrub sites have fewer arthropod predator species such as scorpions and trap-door spiders, and are dominated by exotic arthropods such as Argentine ants, European earwigs (*Forficula auricularia*), pillbugs and sowbugs (*Armadillidium vulgare* and *Porcellio* sp.), and the sowbug killer (*Dysdera crocata*) (Longcore 2003). These changes in arthropod species diversity will have resonating impacts on vertebrates that use arthropods as prey species. Suarez et al. show that coast horned lizards prefer native ants (*Pogonomyrmex* and *Messor* spp.) as their food source and suffer when these species are eliminated by invading Argentine ants (Suarez et al. 1998).

Disturbance associated with road building and vegetation clearance promotes the invasion of plant species already associated with residential development. Alien plant species found in southern California wildlands are largely associated with disturbed areas, including cleared areas (Rundel 2000). This relationship between invasive exotics and disturbance is found throughout California and in other Mediterranean regions (Kotanen 1997; Rundel 1998). The understories of areas subject to fuel modification are rapidly dominated by invasive exotic grasses and forbs. As described by Keeley, "Prefire fuel manipulations such as fuel breaks produce conditions that favor weedy aliens and thus act to increase the alien presence, increase the movement of aliens into wildlands, and increase seed sources capable of invading after fire" (Keeley 2002). Incidentally, this increases fire frequency as well (Minnich and Dezzani 1998).

As discussed extensively in the literature (Mooney et al. 1986, Minnich and Dezzani 1998; Rundel 1998), invasive plant species can profoundly affect ecosystem structure and function by modifying fire regimes, nutrient cycling, and erosion patterns. The roads, towers, and associated fuel modification will affect an area far greater than the footprint of these activities themselves by promoting the invasion of exotic plants and animals into wildlands.

Inadequacy of Analytical Approach

The presentation of significant impacts categorized by impact class and associated mitigation measures without the necessary studies is a hallmark of the DEIR/EIS. In numerous instances the DEIR/EIS makes conclusions about the severity of impacts based on incomplete information and defers the surveys necessary to gather this information until after project approval. An environmental disclosure document fails if it simply acknowledges vague significant impacts but does not actually provide information about the scope and nature of these impacts. This information is critical because it is needed for the public and decisionmakers to determine if mitigation measures can offset the impacts, whether impacts can be avoided, and whether it is tolerable to approve the project even though the significant impacts remain. The non-specific approach characterized by the entire DEIR/EIS denies the public and decisionmakers knowledge of the actual extent of the impacts on biological resources. For example, the DEIR/EIS acknowledges that the development of a project in Mexico near La Rumorosa would create a significant impact from the collision of birds with turbines (p. D.2-263) but provides no further detail on the scope of this impact or the species that are likely to be involved, save for a general species list (p. D.2-248). It might have been possible, based on site surveys and comparison with other wind projects, to predict that the project would kill around 815 birds per year (using the equation in the caption of Figure 1 of Barclay et al. 2007 as a rough approximation, assuming 125 440-foot tall turbines). This number could include golden eagles and other sensitive species. Collision mortality would be a significant impact that cannot be mitigated, which is the same conclusion reached in the DEIR/EIS, but such descriptions of magnitude would allow decisionmakers to weigh whether the overall benefit of the proposed project would be greater than the significant impacts it would have.

Another example illustrates the need for more specificity in the impact analysis. The DEIR/EIS provides no estimate of the number of birds that might collide with the transmission wires or what species they might be. Absent the field surveys necessary to describe such risks, the scientific literature provides some guidance. Janss and Ferrer (1998) found 43 birds in 20 surveys conducted over two years with some spans marked with diverters during the second year on 4.5 km of 380 kV line on lattice towers through scrubland, grassland, and agricultural lands in Spain, equaling 1.7 birds per mile per year. Approximately 30% of these birds were common cranes

Of the several routes running south down Route 79 from the Lake Henshaw area, the Santa Ysabel SR79 Underground option is superior because it avoids the fragmentation and habitat loss associated with the aboveground route and its access roads.

Farther along in the Coastal Link, the Los Peñasquitos Canyon Preserve and Mercy Road Alternative is an underground route that is worse than the proposed project because it disturbs existing preserve areas. This raises an additional question for the evaluation of project impacts. The DEIR/EIS reports on the compliance of various routes with federal, state, and local land use plans. It is not evident, however, whether the project would involve construction and impacts in areas that were set aside as mitigation in previous CEQA or NEPA documents. Many of the developments in San Diego County were approved based on assumptions about the protection of habitats set aside within and adjacent to the developments in addition to off-site mitigation sites.

The southern transmission route is superior to the northern route because it follows an existing transmission line through much of the inland reaches, then follows Interstate 8 through the mountains. By staying close to existing development and disturbance sources this route is somewhat less damaging than the northern route. The DEIR/EIS, however, identifies Modified Route D as part of its "environmentally superior" southern route. From a biological perspective, Route D is worse than the Interstate 8 alignment because it is longer, destroys more native vegetation, and would disturb an additional golden eagle nest site and additional least Bell's vireo habitat. The only reason the DEIR/EIS identifies Modified Route D as superior is because of reduced visual impacts, but this choice comes at the expense of biological resources.

Wind Development

The DEIR/EIS contains a description of impacts and mitigation measures for the development of a wind power generation project to be located at an undetermined site in northern Mexico near La Rumorosa. The DEIR/EIS does not describe the exact route for the transmission line either in Mexico or the United States or the location of the wind turbines. This portion of the DEIR/EIS fails to meet common standards for provision of a complete and consistent project description. It furthermore fails to show adherence to the State of California's guidelines for design and siting of wind facilities to reduce impacts to birds and bats (California Energy Commission 2007).

These guidelines identify the need to collect one or more years of field data on bird and bat populations for projects located in areas that may impact special status species (California Energy Commission 2007, p. 9). The DEIR/EIS simply cannot support any conclusions about the proposed project element without conducting the necessary field studies.

The description of the impacts of wind development contains the assertion that taller towers would decrease raptor mortality at the La Rumorosa site (D.2-262). However, recent research has shown that turbine height is weakly and positively correlated with bird mortality, and taller turbines kill exponentially more bats than shorter turbines (Barclay et al. 2007). Bat mortality at wind projects is a grave conservation concern (Kunz et al. 2007; Arnett et al. 2008) and recent research should be incorporated into the DEIR/EIS to identify and avoid these impacts.

Conclusion

The absence of detail about the magnitude and species-specific context of impacts is a pervasive problem with the DEIR/EIS. The logical and factual basis upon which evaluation of mitigation and minimization measures rests is absent in many instances. Useful comparative information from other similar projects that might help quantify impacts is missing. In sum, the DEIR/EIS is insufficient because it fails to identify significant impacts that will result from the project, it fails to provide adequate descriptions of the identified significant impacts and their mitigation measures, and it lacks the analytical connective reasoning to place impacts to biological resources in context.

I declare under penalty of perjury this testimony is, to the best of my knowledge, true and correct.

/s/ Dr. Travis Longcore

Comment Letter O12

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via email and FedEx

10/6/2011

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Re: Comments on Draft Plan Amendment & Draft Environmental Impact Statement/Draft Environmental Impact Report for the Ocotillo Wind Energy Facility. DOI Control No. DES 11-20 and SCH No. 2010121055

Dear Mr. Perry and Ms. Havens

These comments are submitted on behalf of the Center for Biological Diversity (Center) regarding the Draft Plan Amendment and Draft Environmental Impact Statement/Draft Environmental Impact Report for the Ocotillo Wind Energy Facility. DOI Control No. DES 11-20 and SCH No. 2010121055.

Introduction

The development of renewable energy is a critical component of efforts to reduce greenhouse gas emissions, avoid the worst consequences of global warming, and to assist California in meeting emission reductions. The Center strongly supports the development of renewable energy production, and the generation of electricity from wind power. However, like all projects, proposed wind power projects should be thoughtfully planned to minimize impacts to the environment. In particular, renewable energy projects should avoid impacts to sensitive species and habitat, and should be sited in proximity to the areas of electricity end-use in order to reduce the need for extensive new transmission corridors and the efficiency loss associated with extended energy transmission. Only by maintaining the highest environmental standards with regard to local impacts, and effects on species and habitat, can renewable energy production be truly sustainable.

O12-01

Unfortunately, the Draft Environmental Impact Statement/ Draft Environmental Impact Report (DEIS/R) for the proposed plan amendment and right-of-way application fails to provide adequate identification and analysis of the significant impacts to water resources, water quality, ephemeral streams and washes, Peninsular bighorn sheep, flat-tailed horned lizard, birds, bats, rare plants, other biological resources, cumulative and growth inducing impacts of the project, and lacks consideration of a reasonable range of alternatives. In addition, the agencies have

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failed to fully examine in impact of the proposed plan amendment (and other similar proposed plan amendments) that would result in industrial sites sprawling across the California Desert within habitat that should be protected to achieve the goals of the federal bioregional plans as a whole and specifically habitat that is essential to the recovery of the endangered Peninsular bighorn sheep.

Purpose And Need and Project Description are Too Narrowly Construed and Unlawfully Segment the Analysis

Agencies cannot narrow the purpose and need statement to fit only the proposed project and then shape their findings to approve that project without a "hard look" at the environmental consequences. To do so would allow an agency to circumvent environmental laws by simply "going-through-the-motions." It is well established that NEPA review cannot be "used to rationalize or justify decisions already made." 40 C.F.R. § 1502.5; *Metcalf v. Daley*, 214 F.3d 1135, 1141-42 (9th Cir. 2000) ("the comprehensive 'hard look' mandated by Congress and required by the statute must be timely, and it must be taken objectively and in good faith, not as an exercise in form over substance, and not as a subterfuge designed to rationalize a decision already made.") As Ninth Circuit noted an "agency cannot define its objectives in unreasonably narrow terms." *City of Carmel-by-the-Sea v. U.S. Dept. of Transportation*, 123 F.3d 1142, 1155 (9th Cir. 1997); *Muckleshot Indian Tribe v. U.S. Forest Service*, 177 F. 3d 900, 812 (9th Cir. 1999). The statement of purpose and alternatives are closely linked since "the stated goal of a project necessarily dictates the range of 'reasonable' alternatives." *City of Carmel*, 123 F.3d at 1155. The Ninth Circuit recently reaffirmed this point in *National Parks Conservation Assn v. BLM*, 586 F.3d 735, 746-48 (9th Cir. 2009) (holding that "[a]s a result of [an] unreasonably narrow purpose and need statement, the BLM necessarily considered an unreasonably narrow range of alternatives" in violation of NEPA).

O12-01 cont

The purpose behind the requirement that the purpose and need statement not be unreasonably narrow, and NEPA in general is, in large part, to "guarantee[ ] that the relevant information will be made available to the larger audience that may also play a role in both the decision-making process and the implementation of that decision." *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989). The agency cannot camouflage its analysis or avoid robust public input, because "the very purpose of a draft and the ensuing comment period is to elicit suggestions and criticisms to enhance the proposed project." *City of Carmel-by-the-Sea*, 123 F.3d at 1156. The agency cannot circumvent relevant public input by narrowing the purpose and need so that no alternatives can be meaningfully explored or by failing to review a reasonable range of alternatives.

The BLM's purpose and need for the proposed Ocotillo Express project is "to respond to a FLPMA ROW application submitted by the Applicant to construct, operate, maintain, and decommission a wind energy-generating facility and associated infrastructure on public lands administered by the BLM in compliance with FLPMA, BLM ROW regulations, and other applicable Federal laws and policies" (DEIS/R at ES-2), and also states that the "BLM authorities include:

- Executive order 13212, dated May 18, 2001, which mandates that agencies act expediently and in a manner consistent with applicable laws to increase the "production and transmission of energy in a safe and environmentally sound manner."
- The Energy Policy Act 2005 (EPAct 05), which sets forth the "sense of Congress" that the Secretary of the Interior should seek to have approved non-hydropower renewable energy projects on the public lands with a generation capacity of at least 10,000 MW by 2015.
- Secretarial Order 3285A1, dated March 11, 2009, and amended on February 22, 2010 which "establishes the development of renewable energy as a priority for the Department of the Interior."

(DEIS/R at ES-2). The DEIS/R notes that an amendment to the CDCA Plan is needed in order to approve the project and proposes the preferred alternative plan amendment of "The CDCA Plan would be amended to approve this site for development of this facility and all other types of wind energy development." (DEIS/R at 2-21). BLM's purpose and need is very narrowly construed to the proposed project itself and various configurations of the proposed. The purpose and need provided in the DEIS/R is impermissibly narrow under NEPA for several reasons, most importantly because it forecloses meaningful alternatives review in the DEIS/R. Because the purpose and need and the alternatives analysis are at the "heart" of NEPA review and affect nearly all other aspects of the EIS, on this basis and others, BLM must revise and re-circulate the DEIS/R.

O12-01 cont

The DOE purpose and need statement is "The purpose and need for action by the DOE is to comply with its mandate under EPAct 05 by selecting eligible projects that meet the goals of the act." (DEIS/R at ES-3)

The Center is well aware that deadlines for funding, particularly for the DOE Loan Guarantee funds, have driven the pace of the environmental review for this project and others and, while such funding mechanisms are important, deadlines cannot be used as an excuse for rushed and inadequate NEPA review. The BLM and DOE must be concerned with the adequacy of the NEPA review and even if the agencies can properly have an objective of *timely* approval of projects they cannot properly have as purpose and need of the project a *rushed* inadequate environmental impact review.

Moreover, in its discussion of the need for renewable energy production the DEIS/R fails to address risks associated with global climate change in context of including both the need for climate change mitigation strategies (e.g., reducing greenhouse gas emissions) and the need for climate change adaptation strategies (e.g., conserving intact wild lands and the corridors that connect them). All climate change adaptation strategies underline the importance of protecting intact wild lands and associated wildlife corridors as a priority adaptation strategy measure.

O12-02

The habitat fragmentation, impacts to avian species, loss of connectivity for terrestrial wildlife, and introduction of predators and invasive weed species associated with the proposed project in the proposed location may run contrary to an effective climate change adaptation strategy. Siting the proposed project in the proposed location impacting ecologically functioning

O12-03

ecosystems, occupied habitat and important habitat linkage areas, major washes and other fragile O12-03 cont
desert resources could undermine a meaningful climate change adaptation strategy with a poorly
executed climate change mitigation strategy. Moreover, the project itself will emit greenhouse
gases during construction and manufacturing in particular and the DEIS contains no discussion
of ways to avoid, minimize or off-set these emissions although such mitigation is clearly O12-04
necessary. The way to maintain healthy, vibrant ecosystems is not to fragment them and reduce
their biodiversity.

Alternatives Analysis is Inadequate

The alternatives analysis is inadequate even with the inclusion two smaller 315 MW
project alternatives. At least one alternative should be considered that avoids of all primary
streams. Moreover, other alternatives should be considered which would avoid both "primary" O12-05
and "secondary" streams including, for example, alternative siting on previously degraded lands.
In addition, the Notice and the DEIS/R should have considered distributed renewable energy
alternatives, a no-build alternative that would focus on programs to efficiency and conservation
efforts which could more than make up in energy savings the power that would be produced by O12-06
this project, and other alternatives that could avoid impacts of the proposed project as well as
impacts of the associated transmission lines and substations.

O12-07 The DEIS/R failed to adequately address such any off-site alternative that would significantly reduce the impacts to water resources and water quality, as well as biological resources including the flat-tailed horned lizard and its occupied habitat, and other special status species including raptors and federally and state endangered Peninsular bighorn sheep.
The Center urges the BLM/County to revise the DEIS/R to adequately address these and other issues detailed below and then to re-circulate both a revised Notice and a supplemental DEIS/R for public comment.

The DEIS Does Not Adequately Describe Environmental Baseline

O12-08 BLM is required to "describe the environment of the areas to be affected or created by the alternatives under consideration." 40 CFR § 1502.15. The establishment of the baseline conditions of the affected environment is a practical requirement of the NEPA process. In *Half Moon Bay Fisherman's Marketing Ass'n v. Carlucci*, 857 F.2d 505, 510 (9th Cir. 1988), the Ninth Circuit states that "without establishing . . . baseline conditions . . . there is simply no way to determine what effect [an action] will have on the environment, and consequently, no way to comply with NEPA." Similarly, without a clear understanding of the current status of these public lands BLM cannot make a rational decision regarding proposed project. *See Center for Biological Diversity v. U.S. Bureau of Land Management, et al.*, 422 F. Supp. 2d 1115, 1166-68 (N.D. Cal. 2006) (holding that it was arbitrary and capricious for BLM to approve a project based on outdated and inaccurate information regarding biological resources found on public lands).

The DEIS/R fails to provide adequate baseline information and description of the environmental setting in many areas including in particular the status of rare plants, animals and communities including Peninsular bighorn sheep, golden eagles, flat-tailed horned lizard, burrowing owls and other imperiled and common desert species.

The baseline descriptions in the DEIS/R are inadequate particularly for the areas where surveys were a single season, a day, or not performed at all. As discussed below, because of the deficiencies of the baseline data for the proposed project area, the DEIS/R fails to adequately describe the environmental baseline. Many of the rare and common but essential species and habitats have incomplete and/or vague on-site descriptions that make determining the proposed project's impacts difficult at best. Some of the rare species/habitats baseline conditions are totally absent and as a result no impact assessment is provided either. A supplemental document is required to fully identify the baseline conditions of the site, and that baseline needs to be used to evaluate the impacts of the proposed project. **O12-08 cont**

Failure to Identify and Analyze Direct and Indirect Impacts to Biological Resources

The DEIS/R fails to adequately analyze the direct, indirect, and cumulative impacts of the proposed project on the environment. The Ninth Circuit has made clear that NEPA requires agencies to take a "hard look" at the effects of proposed actions; a cursory review of environmental impacts will not stand. *Idaho Sporting Congress v. Thomas*, 137 F.3d 1146, 1150-52, 1154 (9th Cir. 1998). Where the BLM has incomplete or insufficient information, NEPA requires the agency to do the necessary work to obtain it where possible. 40 C.F.R. §1502.22; *see National Parks & Conservation Ass'n v. Babbitt*, 241 F.3d 722, 733 (9th Cir. 2001) ("lack of knowledge does not excuse the preparation of an EIS; rather it requires [the agency] to do the necessary work to obtain it.")

Moreover, BLM must look at reasonable mitigation measures to avoid impacts in the DEIS/R but failed to do so here. Even in those cases where the extent of impacts may be somewhat uncertain due to the complexity of the issues, BLM is not relieved of its responsibility under NEPA to discuss mitigation of reasonably likely impacts at the outset. Even if the discussion may of necessity be tentative or contingent, NEPA requires that the BLM provide some information regarding whether significant impacts could be avoided. *South Fork Band Council of Western Shoshone v. DOI*, 588 F.3d 718 , 727 (9th Cir. 2009). **O12-09**

The lack of comprehensive surveys is particularly problematic. Failure to conduct sufficient surveys – and a single year or season is inadequate to evaluate the resources and uses on this large of a project site - prior to construction of the project also effectively eliminates the most important function of surveys - using the information from the surveys to avoid and minimize harm caused by the project and reduce the need for mitigation. Often efforts to mitigate harm are far less effective than avoiding and preventing the harm in the first place. In addition, without understanding the scope of harm before it occurs, it is difficult to quantify an appropriate amount and type of mitigation.

The DEIS/R fails to provide all of the information necessary for decisionmakers and the public to adequately review the proposed project. Therefore the impacts cannot be fully analyzed or mitigated appropriately or fully. For this reason alone, a supplemental or revised DEIS needs to be provided and additional alternatives are included (including a preferred alternative) that avoids and reduces the impacts to biological resources. O12-09 cont

Avian Species and Risk Assessment

While the DEIS/R attempts to provide a risk assessment to avian species (primarily birds) and collision with wind turbines, recent science shows that "No relationship between variables predicting risk from E[nvironmental] I[mpact] A[ssessments]s and actual recorded mortality was found" and more importantly that "EIAs are usually conducted at the scale of the entire wind farm. The correlation between predicted mortality and actual mortality must be improved in future risk assessment studies by changing the scale of these studies to focus on the locations of proposed individual wind turbine sites and working on a species specific level".[1] Unfortunately the DEIS/R risk assessment is at the scale of the entire wind project and fails to evaluate specific turbine locations and their impact on avian species. Therefore, additional analysis must be provided through individual wind turbine analysis (microsite analysis), based on the number of avian species with potential for impact. This analysis would then provide information that could also help inform additional siting alternatives that could also be designed to minimize impacts to rare, migratory and resident avian species. O12-10

Migratory Birds

The document briefly discusses migratory birds and migratory pathways in southern California. However, nocturnal bird migration was not studied or addressed in the DEIS/R at all. Recent published scientific reports indicate that greater than 10% of nocturnal migrating songbirds migrating over ridges fly at elevations putting them within the area of rotating turbines.[2] An on-site nocturnal radar study in California's desert at San Gorgonio Pass prior to the wind energy development there, reported that "approximately 37 million birds passed through the Coachella Valley in the fall and an additional "approximately 32 million birds flew through the Coachella Valley during spring 1982," making the total in 1982 approximately 70 million birds. The study concludes "we estimate that approximately 256,000 birds/km could potentially come into contact with wind turbine generators each fall in the WRSA" and "approximately 182,000 birds/km potentially come into contact with wind turbine generators each spring."[3] The document needs to analyze the on site impacts of the larger turbines proposed at Ocotillo Express Wind project on nocturnal migratory songbirds and bats in comparison to this data on a nearby site. O12-11

Furthermore, the DEIS/R fails to acknowledge that the Ocotillo wind project is located on the Pacific Flyway and provides no data for the impacts of the project on nocturnal migratory birds and bats or on migratory pathways for birds and bats. Migratory birds are protected by the Migratory Bird Treaty Act of 1918 and the project must identify, analyze and address these impacts. O12-12 Recent research has established that species such as golden eagles tend to hunt or migrate at or below ridgelines, potentially putting these species at risk especially for turbines that O12-13 are deployed in ridge areas (Manville 2009). The proposed "mitigation" measure is to have a biologist full time during daylight hours for the first 3 years of operation, with the "primary purpose of" having the biologist detect golden eagles from the observation tower "prior to eagles flying in to the site using the Applicant's Merlin Avian Radar System and high-resolution video camera system technology, combined with the use of spotting scopes and binoculars. If eagles are detected, the biologist would have the ability to shut down the WTGs in portions of the site to help minimize and avoid collisions with WTGs. The WTG blades would come to a complete stop within 60 seconds of WTGs being shut down. The biologist would be responsible for determining when the eagle has left the project site so that operation of the WTGs could resume." DEIS/R at 4.21-15. This proposal even if it might prove effective for eagles (which is not certain) does nothing for other raptors and birds protected under the MBTA or nocturnal migration. Furthermore, the "mitigation" measure, if effective, simply delays impacts to golden eagles for 3 years after which time no one will be watching or turning off the turbines and collisions with turbines by golden eagles will occur. This measures does nothing for nocturnal avian and bat migration, which remains and unidentified issue and unanalyzed impact. **O12-13 cont**

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[1] Ferrer et al. 2011

[2] Mabee at al. 2006

[3] McCrary, et al 1982

Raptors

Raptors are highly vulnerable to collision with wind turbines. The EIS/R and Appendices are unclear regarding the methodology used for the raptor migration study, and exactly how many hours of surveys were actually done. Industry standards for large bird surveys defined by Hawk Migration Association of North America, Hawk Watch International, Cape May Bird Observatory and others recommend all day surveys every day to determine raptor use on the site. Only by using this method can relatively rare events such as occasional large migration flocks of Swainson's Hawks, which are known to congregate nearby, turkey vultures or other raptors and white pelicans be detected. A less rigorous survey approach would easily miss the presence of Golden Eagles during migration or from nearby nests that were documented, two of which are reported as active. **O12-14**

Raptor species on the proposed project site are protected under the federal Migratory Bird Treaty Act as well, including those species known to be vulnerable to turbine collision such as the redtailed hawk. Many important questions remain unanswered including, for example, the following:

- Aside from the aerial survey completed by the Wildlife Research Institute (WRI), were ground-based raptor nest surveys completed within the Ocotillo Wind project site in order to accurately characterize the resident population density of particularly vulnerable raptor species? **O12-15**
- How close are red-tailed hawk nests and other raptor species nests located to proposed wind turbines? **O12-16**
- Combined with nest survey results, is red-tailed hawk use (data from point count surveys) of the Ocotillo Express Wind project considered reflective of a low or high density of this species as compared to other parts of the County? **O12-17**
- Is the proposed Ocotillo Express Wind project likely to result in impacts to the local population of red-tailed hawks from turbine collision and if so, how will these impacts be minimized? **O12-18**

These and other similar species questions need to be addressed in a supplemental EIS/R, because of the potential for significant impacts to local (and migratory) raptor populations, which are simply not analyzed in the DEIR/S. O12-19

Golden Eagle

The DEIS/R fails to adequately address the issue of golden eagle collisions with turbines. Nor does it address the Bald and Golden Eagle Protection Act, which imposes strict limitations on take of eagles. The Final Rule on Eagle Act Take Permits (74 FR 48635) establishes a "no net loss" standard for eagles, and it is unknown whether proposed mitigation efforts as reflected in an avian protection plan will pass muster with the U.S. Fish & Wildlife Service (USFWS). O12-20 The DEIS/R cites a study in footnotes entitled WRI (Wildlife Research Institute). 2011. However, the cited report is not provided as an Appendix. Instead, the DEIS/R has provided a brief statement of some data from the report. The study that is cited in the DEIS/R must be provided for public review, rather than the abbreviated and interpreted results. O12-21 Additionally, the DEIS/R fails to make any determination on the significance of impacts to golden eagles from the operation and maintenance, which is likely where the greatest and cumulative impacts will occur. O12-22

The DEIS/R also concludes that "As with construction, O&M would not result in direct or indirect impacts to golden eagle nest sites because the nearest nest site is a minimum of 2 miles from the proposed OWEF site" (DEIS/R at 4.21-12). However, the National Golden Eagle Colloquium on March 2-3, 2010 attended by 85 participants from various agencies and Golden Eagle and raptor scientists from across the country contradicts this analysis. The scientists concluded that "[b]uffers we currently recommend are at least 4 - 10 air miles from a golden eagle territory."(note that territory encompasses nest site)4

The DEIS/R also states that "WRI's spring 2010 helicopter surveys within the 5 known golden eagle territories indicated that there are 20 nest sites within 10 miles of the proposed OWEF site." DEIS/R at 3.23-4. All of these nests in the 5 territories are within the avoidance buffer zone from the Colloquium. Additionally, the document does not indicate how close the eagle nests are to the projects site. Eagles often fly much further than a five mile territory. A nest as close as 0.5 miles would predictably kill adult and fledgling eagles, and five territories of golden eagle indicate an unacceptable risk of "take" for golden eagle in mortality and disturbance for a wind project. O12-23

We strongly urge that the DEIS/R be revised and re-circulated in order to reconsider impacts to golden eagles more thoroughly using recommendations and analysis by eagle experts who performed the surveys as well as the data be peer review by qualified independent eagle experts. Such reconsideration would allow the agencies to fully evaluate the site and whether it should be abandoned due to unacceptable, unmitigable risk to golden eagles.

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4 National Golden Eagle Colloquium 2010

California Condor

The DEIS/R's discussion of the California condor does not address San Diego Zoo's Institute for Conservation Research/San Diego Zoo Global's current and future reintroduction plan to increase the population size of this species inhabiting the region south of the proposed project in Baja California. Consideration of potential impacts to California condors from risk of collision with turbines appears inadequate to address expanding range of this species in vicinity of project and ramifications of proposed wind development on ability of this species to continue to persist. The DEIS/R does not address presence/absence/proximity of potential food sources/attractants of California condor to the proposed project, which needs to be included as part of the impact analysis. O12-24

Peninsular Bighorn Sheep

Unfortunately, the DEIS/R fails to provide adequate identification and analysis of the potentially significant impacts to the federally endangered and state fully protected Peninsular bighorn sheep (PBS). It appears that the DEIS/R relies on a single year study on PBS use of the site (DEIS/R at 3.23-22 and Appendix D pg. 48). The study also indicates that it is ongoing and the full results of the study are not presented (Appendix E pg. 48). The DEIS/R identifies that "A total of 3,691.9 acres of USFWS Essential Habitat occurs on the proposed OWEF site" (DEIS/R at pg. 4.21-8). While the document relies on USFWS' definition of "Essential Habitat" as ½ mile from the base of a 20% slope and is the basis for addressing impacts, we note that USFWS document[5] itself notes that ½ mile is the minimum range, while PBS have been documented to use areas up to 1.6 miles away from 20% slope. Many of these low relief areas include crucial alluvial fan foraging habitat that is key to nutritional needs of PBS during the early spring. In reality, Peninsular bighorn range into areas outside of the "essential" habitat areas and use alluvial fan habitat and lower elevation habitat in critical early spring months when forage at higher elevations is not yet available. Therefore, the project will clearly impact crucial early spring foraging habitat for this imperiled species. The single year study does state "Historic PBS sign has been documented within each of the 3 PBS survey areas" (DEIS/R Appendix D at pg.47), which indicates that PBS indeed have used the proposed project site in the not too distant past, because sign (scat, hair, tracks) do not persist for indefinitely. In this case "historic" is not defined, and could be just a year or two old. Without site-specific data on the details of habitat use patterns of the bighorn in the area, the DEIS/R cannot properly assess the importance of the habitat to the bighorn population or the impact of its loss on the population. O12-25

Lambing area in the I-8 "island" has only recently been recolonized (DEIS/R, Appendix D pg.48), and now the proposed project is intending to construct eight wind turbines within 3,900 feet of this reproductively important area (DEIS/R, Appendix D pg.72). No evidence is provided that PBS will acclimate to wind towers, which may operate intermittently and will require routine maintenance post construction. No safeguards are in place to assure that the I-8 lambing areas remain viable and are not abandoned as lambing areas or travel corridors. O12-26

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[5] USFWS 2000

It is unclear why 1000 feet was selected as the range at which O&M activities would not affect PBS (DEIS/R at pg. 4.21-49). O12-27

The proposed project may affect foraging areas and movement corridors for bighorn, as well as fragmenting currently intact habitat. The DEIS/R simply dismisses the potential for occurrence of bighorn on the site despite documentation of a foraging ewe group directly to the west of the proposed project site on the proposed Imperial Valley solar site. Therefore it also fails to analyze the impacts to this endangered species. The DEIS/R incorrectly evaluates that only 43.9 acres of essential habitat will be permanently impacted by the project (at 4.21-46) and only 129.5 acres will be temporarily impacted. In both cases only a 1:1 mitigation is proposed ignoring for the loss of access to forage and movement areas and fragmentation of habitat by the construction of the proposed project. Moreover the temporary impacts are inappropriately proposed to be mitigated strictly by revegetation. Revegetation standards applied by the BLM fall well short of habitat requirement of PBS by only requiring 30% of the original cover (original cover typically ranging from 12-20%) and 40% of the original diversity after 5 years. Project development will result in a net loss to the species and should be mitigated appropriately. In fact, as the DEIS/R identifies over 3,600 acres of essential habitat for PBS is on-site and will therefore be directly or indirectly impacted. . A 1:1 mitigation ratio simply allows for a net loss of habitat for the PBS (also see discussion below on inadequacy of mitigation ratio). and should be mitigated at a minimum of 3:1 where the mitigation benefits PBS in perpetuity. O12-28

Even the purchase of lands elsewhere will do nothing to mitigate for the impact to movement corridors onsite, such as the migration routes from the Jacumba mountains to lambing areas in the Coyote mountains, so the DEIS/R needs to identify this issue and re-design the project to avoid these impacts. Because these data and subsequent analysis are lacking for this imperiled species, the DEIS/R fails to comply with CEQA or NEPA. O12-29

By assuming that Peninsular bighorn sheep were not and in the future will not be present on the proposed project site, the DEIS/R fails to evaluate the impact on the species from increased human activities and the wind towers themselves particularly regarding noise. While no published literature is available on the effects of wind towers on activities of bighorn sheep, data does exist that indicates increased human presence and noise cause sheep to avoid portions of habitat.[6] O12-30

Additionally, an incomplete analysis was provided on the cumulative impacts to the PBS from this and the adjacent proposed and construction projects including Sunrise Powerlink transmission line, Tule Wind project, Imperial Solar project and others that have potential significant impact on the Peninsular bighorn. The combination of these projects significantly narrows the movement corridor for bighorn in this area. The cumulative analysis also fails to assess the metapopulational impacts from not only these proposed projects, but the projects in Mexico, which will likely cut off the remaining connectivity between Peninsular bighorn sheep in Baja and the United States, further isolating both populations which will cause continued declines on both sides of the border for this iconic species. O12-31

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[6] Papouchis et al. 2001

Furthermore, mitigations for impacts to PBS (or other species) must actually mitigate for the impacts. For example enhancement of riparian areas through tamarisk abatement, while beneficial to a suite of species including PBS, does not mitigate for impacts to foraging areas or lambing areas. O12-32

Because of the short-comings in the CEQA/NEPA review, the BLM and Imperial County need to provide a supplemental DEIS/R that includes adequate analysis of the impacts to the state and federally endangered Peninsular bighorn sheep.

Barefoot Banded Gecko

The surveys for the barefoot banded gecko are incomplete, because, as the DEIS/R recognizes, not all of the impact area has been surveyed to required protocol levels (Appendix D1 at 13). Clearly the project NEPA/CEQA is rushed and incomplete because necessary surveys have not been completed and provided for public review. The results of the surveys need to be included in a supplemental or revised DEIS/R. Impact analysis is also therefore incomplete. O12-33

Flat-tailed Horned Lizard

Declines in populations of and habitat for the flat-tailed horned lizard were noted for decades resulting in a proposed listing of the species in 1993. Several legal challenges and court orders have resulted in the U.S. Fish and Wildlife Service reviewing data to determine if the species needs federal Endangered Species Act protection and it recently found that is does not warrant listing based in part on conservation measures in place in the California Desert. In the more than 15 years since this listing was first proposed in 1993, the threats to the flat-tailed horned lizard have only increased. Clearly the lizard is still in decline, and the Flat-tailed Horned Lizard Management Areas, the voluntary conservation agreement that has been in place since 1997 and the Rangewide Management Strategy (2003) are not sufficient to protect the survival of the species or contribute to its recovery. Moreover, threats to the species are increasing and are abundant throughout its range.

O12-34

The flat-tailed horned lizard is particularly at risk due to its increasingly limited geographic range, its specialized and highly fragmented habitat, its sensitivity to anthropogenic effects, its narrow breadth of diet (almost exclusively harvester ants), and the lowest rates of reproduction of all known horned lizards[7]. All of these factors highlight the potential risk of local and regional extinctions for this species and the significance of any additional destruction of its remaining habitat.

Damage to habitat from off-road vehicles has continued in all flat-tailed horned lizard areas, including the Yuha Desert, Coachella Valley, West and East Mesas, near the Algodones Dunes, and near Yuma as well as in other flat-tailed horned lizard habitat. There is increasing ORV use of designated routes as well as increased route proliferation in many areas both within the FTHL Management areas and in lizard habitat outside of these areas. These ongoing and increased impacts remain one of the greatest threats to species survival along with habitat loss from development. Off-road vehicle use and route proliferation both cause direct loss of habitat and increasingly fragment remaining habitats. Habitat fragmentation is a significant factor in decreasing flat-tailed horned lizard survival and may preclude recovery in many areas. A study of flat-tailed horned lizards and other species within a conservation areas found that edge effects from roads had a significant impact on flat-tailed horned lizard populations up to 150 m from roads (as well as impacts from increased predation)[8].

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[7] Barrows and Allen 2009

Several renewable energy projects are proposed within flat-tailed horned lizard habitat including not only the Imperial Valley solar project and the Sunrise-Powerlink transmission line but also the proposed project which includes thousands of acres of flat-tailed horned lizard habitat that will have new access (roads) available. This project could also further fragment the remaining habitat for the species and will cumulatively decrease gene flow between the West Mesa and Yuha Desert area populations. In addition, there are at least another 5 pending right of way applications for both solar and wind projects covering more than 20,000 acres in areas that may include significant lizard habitat some of them adjacent to the management areas.[9] Each of the proposed energy projects will require a new gen-tie power lines that will likely impact lizard habitat and many may also require new substations and other infrastructure that may directly affect lizard habitat. Moreover, these large-scale, single-use projects will displace other multiple uses on public lands and increase the pressure on the FTHL Management areas and other lizard habitat from off road vehicle (ORV) use.

O12-34 cont

Loss of habitat due to urban sprawl development and farming was the largest historic threat to the flat-tailed horned lizard. One new sprawl development proposal that may impact flat-tailed horned lizards and their habitat in Imperial County is the Travertine Point which proposes 12,000 housing units on nearly 5,000 acres adjacent to the Salton Sea.[10] In addition, the renewable energy projects and associated transmission, as discussed above, represent another kind of sprawl development that threatens the survival of the species through direct loss of habitat as well as increasing fragmentation of habitat. For this reason, we and others have advocated for siting the new renewable energy projects on previously degraded sites in the desert habitats (including fallowed farmlands). While we are cognizant that wind projects are sited for the best wind resources, nonetheless alternative siting should have been more fully considered here.

The flat-tailed horned lizard has largely been extirpated from the Coachella Valley outside of existing conservation areas and the little remaining habitat in Coachella Valley continues to be lost to sprawl development. Problems with small reserve size, invasive weeds, loss of sand sources, and boundary effects suggest the current Coachella Valley reserve will not ensure the survival of the flat-tailed horned lizard in the Coachella Valley. Barrows et al. (2006) noted the significant "sink" effect along the boundary areas and cautioned "Without immigration from the preserve core, flat-tailed horned lizards may not be able to sustain populations in the boundary region." This same concern regarding boundary effects arises for the management areas where routes already fragment the management areas and where additional development is proposed on the borders. This project could similarly limit the effectiveness of the FTHL Management areas by fragmenting the habitat and cutting off connectivity between areas.

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[8] Barrows et al. (2006); *see also* Barrows and Allen (2009) (discussion of habitat loss and high degree of fragmentation in remaining habitats).

[9] *See* maps and data available on BLM website for renewable energy projects at http://www.blm.gov/ca/st/en/fo/cdd/alternative_energy.html

[10] Documents available at http://www.tlma.co.riverside.ca.us/planning/content/temp/sp375.html

The Sunrise Powerlink powerline project is also directly impacting lizard habitat. This project increases the likelihood that other proposed energy projects will be built in areas that will directly affect the lizard including the proposed project. Powerlines also provide perches for raptors which then prey on the flat-tailed horned lizards, putting further unnatural predation pressures on this declining species.[11]

O12-34 cont

On-going and increasing impacts to flat-tailed horned lizard habitat near the US-Mexican border in CA and AZ are also of concern particularly off-road vehicle use by border patrol agents (and others). Border Patrol 'tire drags' of dirt roads in lizard habitat are also a problem and continue to kill or injure lizards. The spread of non-native mustards and other invasive plants may also threaten flat-tailed horned lizard habitat viability. Even if exotic plant species do not directly change the habitat character or decrease food sources, many of these invasive weed plants can support and spread fire that could kill or injure lizards in an area where fire would naturally be an extremely rare occurrence.[12] The proposed project and its associated gen-tie lines could also greatly increase the likelihood of fire and the impacts to the lizard and other wildland resources should have been considered in the DEIS/R but were not.

O12-35

Many of the existing and proposed development projects including the proposed project as well as ORV use will increase the likelihood of predation of flat-tailed horned lizards further diminishing their numbers and ability to survive. Barrows et al. (2006) found a significant increase predation in their study of boundary effects. Increased development provides new roosting and nesting sites for predators including for example shrikes and kestrels which are known predators of the flat-tailed horned lizard. It is well established that increases in subsidies from human activities which provide additional water sources and food/trash also increase other potential predators such as ravens.

O12-36

Threats to the flat-tailed horned lizard from climate change are significant for several reasons. First, a recent study shows that desert areas may be some of the first affected by increasing temperature and that the changes may be more rapid in these ecosystems making adaptation more difficult[13]10. Second, the existing and likely increasing fragmentation of the lizard's habitat by the proposed project and others will make any adaptation through movement across the landscape far more difficult. Thus, the flat-tailed horned lizard although adapted to hot desert environments may nonetheless be significantly impacted by climate change due to its loss of habitat and the constraints on adaptation.

O12-37

While the FTHL Rangewide Management Strategy (2003) established Management Areas for the conservation and recovery of the flat-tailed horned lizard, it fails to include

O12-38

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[11] Barrows et al. 2006

[12] Brooks et al. 2004

[13] Barrows et al 2009

connectivity corridors that will help to ensure genetic viability of the core Management Areas. The proposed project site clearly supports occupied habitat for the flat-tailed horned lizard – although estimate of the density of flat-tailed horned lizards was provided, and the survey results no doubt underestimates the actual number of animals that will be impacted. It also fails to analyze the important linkage that the proposed project area provides between the adjacent management areas (Yuha and West Mesa). **O12-38 cont**

The DEIS/R states "Permanent impacts to 30.3 acres and temporary impacts to 107.1 acres of occupied FTHL habitat from the Proposed Action shall be mitigated at a 1:1 ratio." (at 4.21-44). This estimation of impacts fails to include the indirect impacts to flat-tailed horned lizard habitat. "Temporary" impacts in the desert are of long-term significance even with "revegetation'. Additionally, a 1:1 mitigation ratio simply allows for a net loss of habitat for the FTHL (also see discussion below on inadequacy of mitigation ratio). **O12-39**

Impacts to the flat-tailed horned lizards and other affected species must be avoided where possible through a robust alternatives analysis and any remaining impacts should be minimized and mitigated. **O12-40** Furthermore, no mitigation for impacts to flat-tailed horned lizard and its habitat are identified in the DEIR/S. Mechanisms need to be included to assure that any and all mitigation acquisitions will be conserved in perpetuity for the conservation of the flat-tailed horned lizard. If those acquisitions are within existing Management Areas, higher levels of protection than are currently in place for Management Areas need to be put in place. NEPA mandates consideration of the relevant environmental factors and environmental review of "[b]oth *short- and long-term* effects" in order to determine the significance of the project's impacts. 40 C.F.R. § 1508.27(a) (emphasis added). **O12-41** BLM and Imperial County must provide a supplemental DEIR/S that includes all of the relevant significant effects in this instance with respect to the impact to the flat-tailed horned lizard. **O12-42**

Burrowing Owl

The DEIS/R notes that burrowing owls are located in the proposed project area (DEIS/R at 3.23-5). Recent data from the statewide census identified that the Sonoran desert harbors few Western burrowing owls.[14] Even more worrisome is the documented crash of burrowing owls in their former stronghold in the Imperial Valley. The Imperial Valley has had a recently documented decline of 27% in the past 2 years[15], resulting in an even more dire state for burrowing owls in California. Because burrowing owls are in decline throughout California, and now their "stronghold" is documented to be declining severely, the burrowing owls on this proposed project site (and on other renewable energy projects) become even more important to species conservation efforts. The recirculated or supplemental DEIS needs to evaluate the potential impact of the proposed project on this regional distribution of owls. **O12-43**

While habitat acquisition specifically for burrowing owls as identified in the DEIS, the proposed mitigation of only 6.5 acres per "active burrow" is too low (DEIS at 4.21-5), especially in the Colorado Desert, because it is outdated agency guidance. Mean burrowing owl foraging **O12-44** territories are 242 hectares in size, although foraging territories for owl in heavily cultivated areas is only 35 hectares[16]. Regardless, the acquisition of only 6.5 acres (2.6 hectares) per "active burrow" fails to mitigate for one bird even if it was relying on a heavily cultivated area.

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[14] Wilkerson and Siegel 2011
[15] Manning 2009

O12-44 cont

Therefore, additional mitigation acreage needs to be required – calculated by using the mean foraging territory size times the number of owls. Using the average foraging territory size for mitigation calculations may not accurately predict the carrying capacity and may *overestimate* the carrying capacity of the proposed project site – it may be that in this area of the Colorado desert 15,000+ acres is necessary to support 20 burrowing owls (DEIS at 3.23-5). While the DEIS relies on guidance from CDFG from 2003, that guidance is now out of date in light of identified population declines[17], a more thorough census of burrowing owls throughout the state[18] and additional research on the species habitat[19]. Lastly, because the carrying capacity for burrowing owls is tied to habitat quality, language should be included that mitigation lands that are acquired for burrowing owl be native habitats on undisturbed lands, not cultivated lands, which are subject to the whims of land use changes. The long-term persistence of burrowing owls lie in their ability to utilize natural landscapes, not human-created ones.

O12-45

While "passive relocation" does minimize immediate direct take of burrowing owls, ultimately the burrowing owls' available habitat is reduced, and "relocated" birds are forced to compete for resources with other resident burrowing owls and may move into less suitable habitat, ultimately resulting in "take". Other renewable energy projects in the area have been required to construct two burrows for every burrowing owl burrow disturbed or destroyed and this strategy should be included in the supplemental DEIS/R.

Bats

O12-46

The DEIS/R is woefully inadequate in assessing potential impacts to bats. It fails to identify the most deadly menace that wind projects pose to this species which is barotrauma.[20] The bat species detected on site or species with high potential to occur on site (DEIS/R at 3.23-8 to 9) are all sensitive species and should have full environmental review of potential impacts from barotraumas.

The DEIS/R states that no bat roosts were found on site, but completely fails to evaluate bat foraging on site. In addition, the DEIS/R fails to address a potential impact that could be avoided – the color of the turbine towers. Studies have shown that the color of the typical turbine towers is key in attracting insects on which bats prey at significantly higher levels.[21]

Additionally data suggest that bat mortality at tall wind turbines is directly linked to nocturnal insect migrations[22], yet this issue is also not addressed in the DEIS/R and needs to be included in a supplemental DEIS/R. With the numerous bat species that are currently foraging or have potential to forage on the project site, the impact analysis is woefully inadequate. **O12-46 cont**

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[16] USFWS 2003
[17] Manning 2009
[18] Wilkerson and Siegel 2011
[19] USFWS 2003
[20] Baerwald et al. 2008.
[21] Long 2011
[22] Rydell 2010

Cryptobiotic Soil Crusts Should be Identified and Avoided.

The proposed project is located in the Imperial Air Pollution Control District, which is already in non-attainment for PM-10 particulate matter[23]. The construction of the proposed project further increases emissions of these types of particles because of the disruption and elimination of potentially hundreds of acres of cryptobiotic soil crusts. Cryptobiotic soil crusts are an essential ecological component in arid lands. They are the "glue" that holds surface soil particles together precluding erosion, provide "safe sites" for seed germination, trap and slowly release soil moisture, and provide CO_2 uptake through photosynthesis[24].

O12-47

The DEIS/R does not describe the on-site cryptobiotic soil crusts. The proposed project will disturb an unidentified portion of these soil crusts and cause them to lose their capacity to stabilize soils, trap soil moisture and keep small soil particles from becoming airborne (PM_{10}). The DEIS/R fails to provide a map of the soil crusts over the project site, and to present any avoidance or minimization measures. It is unclear how many acres of cryptobiotics soils will be affected by the project. The revised or supplemental DEIS/R must identify the extent of the cryptobiotic soils on site and analyze the potential impacts to these diminutive, but essential desert ecosystem components as a result of this project.

The Project Should Avoid Impacts to All Desert Washes, Ephemeral Streams, and Riparian Areas

Because of the uniqueness of water resources in the desert, all desert washes, ephemeral streams and riparian areas should be avoided. As the BLM and County are well aware desert riparian areas are fragile and disturbance of the soils in these areas can significantly increase erosion and sedimentation. Although water is scarce and flooding infrequent in desert regions, ephemeral and intermittent streams are a significant ecosystem component and washes are critical to the survival of many native plants and animals. *See, e.g.*, Levick, et al. (2008). "Ephemeral and intermittent streams make up approximately 59% of all streams in the United States (excluding Alaska), and over 81% in the arid and semiarid Southwest (Arizona, New Mexico, Nevada, Utah, Colorado and California)." *Id.* at iii. Ephemeral and intermittent streams provide the same ecological and hydrological functions as perennial streams by moving water, nutrients, and sediment throughout the watershed. When functioning properly, these streams provide landscape hydrologic connections; stream energy dissipation during high-water flows to reduce erosion and improve water quality; surface and subsurface water storage and exchange; ground-water recharge and discharge; sediment transport, storage, and deposition to aid in floodplain maintenance and development; nutrient storage and cycling; wildlife habitat and migration corridors; support for vegetation communities to help stabilize stream banks and provide wildlife services; and water supply and water-quality filtering. They provide a wide

O12-48

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[23] http://www.co.imperial.ca.us/airpollution/default.htm

[24] Belnap 2003, Belnap et al 2003, Belnap 2006, Belnap et al. 2007

array of ecological functions including forage, cover, nesting, and movement corridors for wildlife. Because of the relatively higher moisture content in arid and semiarid region streams, vegetation and wildlife abundance and diversity in and near them is proportionally higher than in the surrounding uplands. *Id.*

The use of washes for any of the proposed project facilities, including access roads and transmission should be prohibited as well as destruction of vegetation. Specifically, creation of a network of new roads in the washes to access turbines and infrastructure outside of the washes should be avoided because such roads would destroy vegetation and habitat, increase siltation, and destroy soil integrity. **O12-48 cont**

Water Quantity and Quality

As the BLM and Imperial County are well aware, the Ocotillo-Coyote Wells Aquifer was designated as a sole source aquifer on September 10, 1996. 61 Fed. Reg. 47752-53. The EPA determined that the aquifer "serves as the 'sole source' of drinking water for the residents of Ocotillo, Coyote Wells, Yuha Estates and Nomirage." *Id.* at 47753. Further, the EPA determined that the aquifer should be protected because "[t]here is no economically feasible alternative drinking water source near the designated area." *Id.* As the EPA noted the boundary of the sole source aquifer area at the Elsinore Fault "separates the sole source aquifer area, which contains high quality, potable water, from high saline, non-potable water to the east of the fault." *Id.* This designation protects this aquifer from contamination by all activities whether by actively polluting the water source or by degradation of water quality due to excessive pumping and overdraft.

O12-49

The newly-proposed use of groundwater for both construction and operation of the proposed project for some length of time could impact existing uses by local communities for drinking water and domestic use and at the expense of other environmental resources as well. Cumulative impacts of this use along with other proposed uses (including existing water use by the Plaster City plant; the proposed expansion of the plant, gypsum mining activities, new well and railroad upgrade; and the Imperial Solar Project) must be identified and analyzed as well. Impacts of the overdraft of this aquifer and use of groundwater by the proposed project must be fully analyzed including impacts such as drawdown of springs and creeks in the area and the impacts to the fragile biological resources of the region that could result including resources in the and San Sebastian Marsh/San Felipe Creek Areas of Critical Environmental Concern (ACECs). Any drawdown of the aquifer would have substantial effects on water supply for other existing users. Moreover, issues regarding use of the water in this aquifer have been in litigation for several years, including issues regarding the possibly catastrophic impacts loss of reliable well water would have on existing communities.

Key Plans Not Provided

The DEIS/R relies on numerous "conservation" plans for on-site resources as avoidance and minimization, however only two of these plans are actually provided for public review (Draft Golden Eagle Conservation Plan and Draft Avian and Bat Protection Plan) and they are **O12-50** *draft* plans only. Absent finalized plans which the wildlife agencies have approved, it remains unclear if the "conservation" plans are actually adequate to minimize and mitigate the consequential impacts. And as noted above, because all of the significant impacts have not yet been identified and analyzed these plans cannot be adequate and must be updated once additional, supplemental environmental review is prepared and circulated for public review.

In addition to the final eagle plan and final avian and bat protection plan, other missing plans include:

- Worker Education Awareness Program (DEIS/R at 4.21-3)
- Raven Control Plan (DEIS/R at 4.21-3)
- Integrated Weed Management Plan (DEIS/R at 4.21-3)
- Revegetation plan for temporarily disturbed areas (DEIS/R at 4.21-3)
- Bighorn Sheep Mitigation and Monitoring Plan (DEIS/R at 4.21-8)
- Property Assessment Report (PAR) for FTHL compensation (DEIS/R at 4.21-41)
- Fugitive Dust Control Plan (DEIS/R at 4.21-41)
- Habitat Restoration/Revegetation Plan (HRRP) (DEIS/R at 4.21-41)
- Wildlife Mortality Reporting Program (DEIS/R at 4.21-41)
- FTHL Status Report (DEIS/R at 4.21-41)

In the absence of these plans, it is impossible to evaluate the minimization of impacts and the actual impacts to the flora and fauna currently on the project site.

O12-50 cont

Increased Access

Currently the proposed project site does not have many roads and is therefore relatively intact and not readily accessible to motorized vehicles. Developing roads for tower installation will have significant indirect impacts on the natural and cultural resources, because it will provide increased access to areas that currently are only accessible by hiking. Additional roads increase the need for BLM and county law enforcement activities and emergency services. BLM law enforcement is already woefully inadequate and additional roads to patrol and monitor activities on will be a significant impact on the law enforcement abilities in the El Centro field office. Additionally, the County will bear the burden for increased emergency services in this area.

These significant impacts are inadequately addressed and remains unmitigated in the DEIS/R, which consequently requires a supplemental EIS/R

O12-51

General Mitigation Acquisition Requirements Are Flawed

The mitigation strategy is inadequate and biologically flawed because it proposes to develop the core habitat for the rare and threatened species and mitigate through acquisition of compensation lands. The generalized strategy of a mitigation ratio for impacts to specific species is proposed to mitigate a multitude of other species – burrowing owl, golden eagles, migratory/special status species birds, badger, and rare plants. Furthermore, the DEIS/R actually fails to require that acquired mitigation lands must be habitat for the specific impacted species. Because any acquired habitat is likely to be already inhabited by the same species for which mitigation is sought, this mitigation strategy ensures a *net decrease* in habitat for impacted

O12-52

species. To actually provide mitigation that staunches species' habitat losses, mitigation ratios must actually address the impacts to each species and must be high enough to fully mitigate the impacts to those species.[25] A *minimum* 5:1 mitigation is more appropriate for all habitat impacts to assure, not only that the project impacts are mitigated, but that the net losses of habitat for rare species are stopped.

O12-52 cont

Conclusion

The DEIS/R is inadequate because it omits important information regarding significant impacts and fail to consider a range of alternatives that will avoid the impacts to sensitive biological resources, water resources and water quality and significant impacts to other resources from the proposed project. The Center urges the BLM and Imperial County to revise the environmental review documents and provide a supplemental DEIS/R that addresses all of the inadequacies detailed in our letter above. Please feel free to contact me with any questions.

Sincerely,

Ileene Anderson
Biologist/Public Lands Desert Director
Center for Biological Diversity

cc: via email
Guy Wagner, USFWS, guy_wagner@fws.gov
Pete Sorensen, USFWS, Pete_Sorensen@fws.gov
Kevin Hunting, CDFG, khunting@dfg.ca.gov
Tom Plenys, EPA, plenys.thomas@epa.gov

Attachment:
Map prepared by the Center for Biological Diversity showing 2001 and 2009 critical habitat designations and the proposed project footprint.

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[25] Moilen et al. 2009, Norton 2009

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BACKCOUNTRY AGAINST DUMPS
PO Box 1275, Boulevard, CA 91905

Cedric Perry, BLM Project Manager October 6, 2011
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via: caocotillo@blm.gov

US Army Corps of Engineers
Los Angeles District, Regulatory Division
Attn: SPL-2009-00971-MBS
via: Meris.Bantilan-Smith@usace.army.mil

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Ocotillo Wind Draft EIS/EIR DOI Control No: DES 11-20; SCH No. 2010121055

WE SUPPORT NO PROJECT; DENIAL OF APPLICANT'S APPLICATION FOR CDCA PLAN AMENDMENT; APPROVAL OF CDCA PLAN AMENDMENT DECLARING THE SITE IS UNSUITABLE FOR WIND; *SOLAR, GEOTHERMAL, MINING, OR OTHER INDUSTRIAL OR EXTRACTIVE USES*. WITH PROTECTION OF THE SITE *WITH A JUSTIFIED ACEC DESIGNATION*. O13-01

Dear Mr. Perry, Ms. Bantilan-Smith, Chairman Terrazas, Supervisors Rennison, Kelly, Wyatt, Castillo and Ms. Havens,

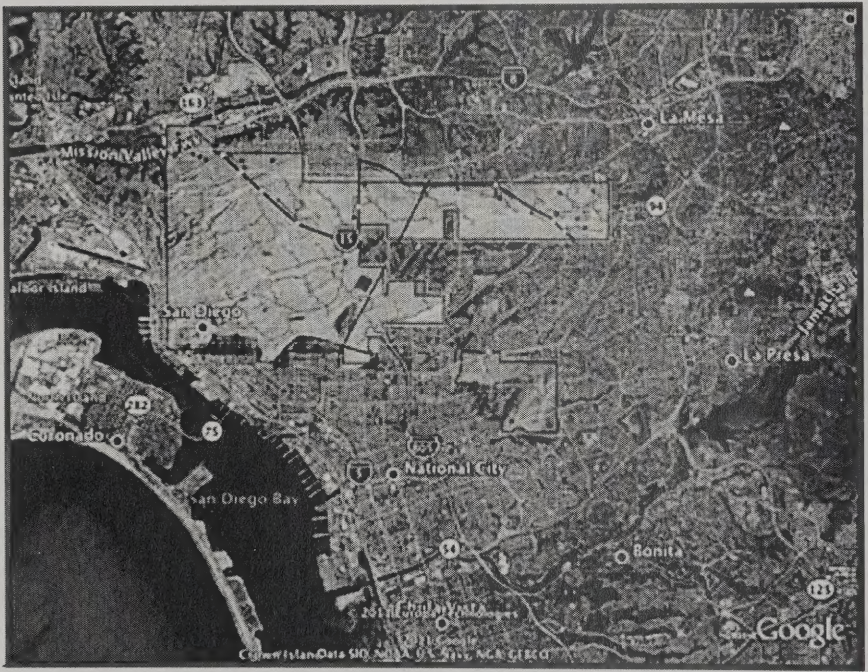
These comments are submitted on behalf of our non-profit groups Backcountry Against Dumps (BAD), The Protect Our Communities Foundation (POC), East County Community Action Coalition (ECCAC), and Donna Tisdale as an individual. Our common goal is to protect and defend rural communities and resources from unnecessary unsustainable development /projects and to encourage less destructive and expensive point of use renewable energy generation that reduces expense, line loss, the need for extensive new transmission lines and infrastructure (with eminent domain), and the unnecessary conversion of public lands and productive irrigated farmland.

These comments are submitted in addition to the formal comments /project reviews by the Law Offices of Stephan C Volker; Richard James, E-Coustic Solutions; and Scott Cashen, Wildlife Ecology Consultant, that are being filed on our behalf. We also want to go on record as supporting and incorporating by reference the numerous Ocotillo Wind comment letters submitted by Viejas Chairman Anthony Pico, Edie Harmon and Basin & Range Watch. We also incorporate by reference our previous formal comments and/protests and/or appeals on Imperial Valley Solar, Tule Wind, ECO Substation, Energia Sierra Juarez, Shu'luuk Wind, Jewel Valley Wind MET towers/appeal, Imperial Solar Energy Center West, Imperial Solar Energy Center South, the wind industry biased USFWS Wind Turbine Guidelines, DCREP, Sunrise Powerlink, Kitchen Creek Wind, SDG&E's Soitec Power Purchase Agreement, SDG&E's Energia Sierra Juarez Power Purchase Agreement and SDG&E's Sol Orchard Power Purchase. O13-02

SIZE DOES MATTER:

Location of project is erroneously stated as being 5 miles west of Ocotillo when it virtually surrounds the Ocotillo / No Mirage communities as so documented by the many project maps. O13-03

The Ocotillo Wind project footprint overlay placed on top of San Diego puts the massive24-square mile project size into perspective.



(Click image to expand) If the Ocotillo Express Wind project is built, it will industrialize a pristine desert landscape the size of San Diego. The Google Earth image above shows the project footprint overlayed on the San Diego metro area. It will consist of nearly150 wind turbines, standing 30 stories tall. That is more tall structures than most American cities have. [1]

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[1] Source: http://www.mojavedesertblog.com/2011/10/wind-energy-waste-wildlands.html

DEIS/EIR is ambiguous, inadequate, and appears designed to intentionally obfuscate the utter lack of real information needed to make an informed decision--especially for those who don't know the area or the industry.

O13-04

The project DEIS/EIR is confusing, woefully inadequate, contains misinformation, contradictory information, and claims and statements that are not supported by facts and/or or current peer-reviewed research and professional opinions. It also lacks critical information, is difficult to review with most graphics in Volume 2 and most text in Volume 1, requiring much back and forth review in attempts to track down and compare for verification and validity. It also fails to fully respond to or acknowledge many of our scoping comments/concerns [2] (starting at page 103 of linked project comments),nor does it document the names of our three groups as specifically listed in those same scoping comments.

O13-05

Two different Comment date deadlines posted:

1. October 5 date posted on BLM El Centro Renewable Energy Project list[3]
2. October 6 date posted at the Ocotillo Express project website[4]

O13-06

Two Conflicting Alternative Numbers 5):

1. Dear Reader Letter dated June 21 (no page #), Alternative 5) of)6 denies the project: *No Project In which the Applicants Application would be denied and the CDCA Plan would be amended to declare the site unsuitable for wind development,*
2. The Abstract on very next page (no page #) , has a completely different and contradictory Alternative 5) that approves the project: *The BLM would grant a ROW for a modified project design with 137 wind turbines.*

O13-07

The Abstract then goes on to say that the "Agency Preferred Alternative covers 12,436 acres" and that the "Draft PA & Draft EIS/EIR identifies impacts of the Preferred Alternative, including impacts related to biological resources, cultural resources, land use, visual and water resources" and that "many of these adverse impacts can be avoided or substantially reduced based on compliance with applicable laws, ordinances, regulations and standards, and compliance with measures provided in this Draft PA& Draft EIS/EIR". The County's preferred Alternative is a reduced and unacceptable 105 turbines.

The Abstract statement above is patently false. The DEIS/EIR does not properly or fully identify significant adverse project impacts, cumulative project impacts, reduction or mitigation, to the following:

- Ambient noise levels / natural quiet is needed to protect circadian rhythms—cyclic responses synchronized to the period of the day—are a fundamental aspect of behavior in humans and all other animals.
- Sense of place
- Public health and safety & Quality of Life
- Water resources

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[2] http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/cdd/energy/0.Par.44477.File.dat/G_Comment_Letters.pdf
[3] http://www.blm.gov/ca/st/en/fo/elcentro.html
[4] http://www.blm.gov/ca/st/en/fo/elcentro/nepa/ocotillo_express_wind.html

O13-07, cont.

- Air quality
- Biological resources including endangered , sensitive, and supposedly protected species
- Cultural resources, Traditional Cultural Properties, that include landscapes, medicinal plants, Golden Eagles, FTHL and more wildlife that are part of wonderful tribal creation stories.
- Historic resources like ancient trails and scenic historic routes S-2[5] , Southern Emigrant Trail, Great Overland Stage Route[6], Mexican mail route, that dates back to 1700s and beyond, used by Mark Twain, Kit Carson, Mormon Battalion, General Kearny, Gold Rush miners and more.
- Dark Skies that also help protect circadian rhythms[7] for people[8], wildlife[9] and even plant life[10]
- Environmental Justice /Socio economic impacts including adverse impacts to property values, increased health care costs, increased expenses for emergency services, road repairs and ongoing maintenance.
- Visual resources with extensive viewsheds and iconic desert landscapes with unique boulder displays

O13-08

No real water Supply identified or verified as legally permitted, sustainable, or fully authorized by the proper San Diego County authorities--who reportedly had not heard from Pattern Energy as of October 5th.

The Draft Plan of Development (POD) 1.3.9 Water Usage, Amounts, Sources (during construction and operations): "Approximately 50 acre-ft of water will be needed for construction including batching concrete, road construction, and dust control, Approximately 6.5 acre-ft will be needed for turbine foundations and approximately 43.5 acre-ft are expected to be required for road maintenance and dust suppression. The current plan is that water will be purchased from a private water well owner near Pine Valley and transported by truck approximately 50 miles (one-way) to the batch plant/laydown area. Investigation into alternative sources of water is ongoing, but in no event will water from the Ocotillo sole-source aquifer be used. Up to two 12,000 gallon temporary water storage tanks may be installed at the concrete batch plant/ laydown area to support these water needs."[11]

The POD statement above is challenged by the EPA scoping comments [12] (starting at page 70 of linked project comments) that are not properly or fully summarized in the DEIS/EIR scoping report regarding the underestimation of the amount of water by over 1/2 of the amount

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[5] http://www.fhwa.dot.gov/infrastructure/back0906.cfm

[6] http://www.anzaborrego.statepark.org/aboutthepark.html

[7] http://www.nigms.nih.gov/Education/Factsheet_CircadianRhythms.htm

[8] http://www.newswise.com/articles/columbia-to-award-the-2011-horwitz-prize-to-biologists-for-their-ground-breaking-studies-on-the-molecular-basis-of-circadian-rhythms

[9] http://docs.darksky.org/Docs/ida_wildlife_brochure.pdf

[10] http://www.abc.net.au/science/articles/2011/09/26/3324816.htm

[11] http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/cdd/energy/pods0.Par.63352.File.dat/Ocotillo%20Draft%20POD%202%2028%2011%20clean%20(3).pdf

[12] http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/cdd/energy/0.Par.44477.File.dat/G_Comment_Letters.pdf

O13-08, cont.

needed per turbine (6,500 gallons per turbine instead of 1,000 gallons fro 1.5 MW) and for dust suppression, estimated at 99 acre feet. More water may be required if 3 MW turbines are used.

O13-09

The DEIS/EIR does not disclose the actual location or ownership of the Project Water Source. Nor does it provide any evidence to back up the claim that no permit is required to mine and export groundwater water from San Diego County to Imperial County

The ownership and actual location of Project's private well water source, located within in the federally designated Campo/Cottonwood Creek Sole Source Aquifer, is undisclosed, unanalyzed, and unacceptable. Long-hauling EPA's estimated 90 plus acre feet of water from one of only two Southern California designated sole source aquifers, to the other designated aquifer cannot and should not be supported by any ethical decision maker or agency.

BAD has a long history of working to protect and defend precious at-risk groundwater resources. In 1993, the USEPA granted our petition for the federal designation of the Campo/Cottonwood Creek Sole Source Aquifer. BAD has adopted this watershed[13]. At their request, BAD also helped the Ocotillo/No-Mirage community with their successful petition for the federal designation of the Ocotillo /Coyote Creek Sole Source Aquifer

O13-10

Ocotillo Wind project is outside IID Service territory and would require a special transfer agreement that does not exist, according to IID staff as of October 5th

Here is the response provided by IID staff on October 5, 2011, in response to a request for information on any IID /Pattern Energy agreements for water to serve Ocotillo Wind: *"I have spoken with Pattern Energy representatives on multiple occasions and have repeatedly advised that their project is outside of the IID water service area. As such IID is not able to serve their demands absent a water transfer. I don't recall any formal water supply request from Patten Energy,* ***I am not aware of any applications or agreements to use IID's Colorado River supplies as a water source for this project, and the transfer mechanism noted in this letter has not been advanced to the point (in my opinion) where it could considered a timely or realistic alternative*** *. I've attached a general letter on this topic that was sent to the Imperial County Planning Department earlier this year on the issue of water use outside the IID service area, and it must have served its purpose as I don't recall any further contact to my office on this matter..."*[14] (emphasis added)

O13-11

What is the wash water source?

POD at page 9: Prior to any hazardous materials being onsite for operations, Ocotillo Wind will prepare and implement a Hazardous Materials Business Plan/Spill Prevention Control and Countermeasures (SPCC) Plan to avoid spills and minimize impacts in the event of a spill. The plan will ensure that adequate containment would be provided to control accidental spills, that adequate spill response equipment and absorbents would be readily available, and that personnel would be properly trained in how to control and clean up any spills. Secondary containment measure that would be employed include containment for pad mount transformer at the turbine sites, containment for the step-up transformers at the substation, and containment for the new and used oil at storage shed located in the O&M facility.

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[13] http://yosemite.epa.gov/water%5Cadopt.nsf/by+State/20E6F17FA1826B59852574F50000836B?OpenDocument

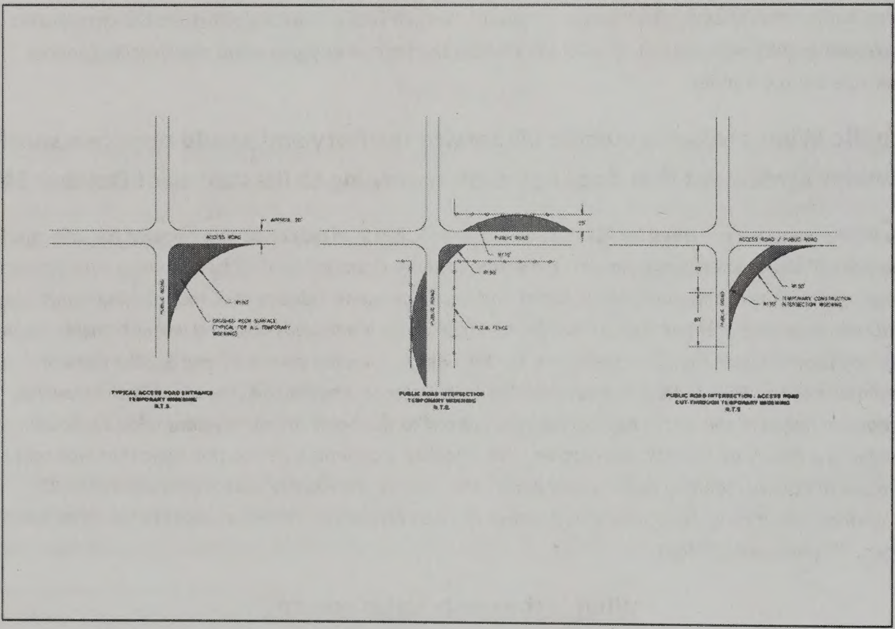
[14] IID letter to Imperial County regarding projects out of IID Service Territory dated 4-14-11 (attached)

O13-11, cont.

According to the USGS Water weight is 8.33 pounds per gallon[15]

How many trucks will be hauling water? What is the weight per truck? What is the impact per truck on old and poorly maintained County roads? Who will pay for it? What are the GHG impacts from that trucking and from hauling turbines from Texas? (See DEIR/EIS Table 7-4 of Construction traffic Distribution Estimate). **Are Imperial County roads ready for industrial wind turbine traffic? Will turbines really be delivered via railroad or by giant trucks on local roads[16]?**

O13-12


APPROX. 20'
ACCESS ROAD
PUBLIC ROAD
CRUSHED ROCK SURFACE (TYPICAL FOR ALL TEMPORARY WIDENING)
TYPICAL ACCESS ROAD ENTRANCE TEMPORARY WIDENING N.T.S.
PUBLIC ROAD
R.O.W. FENCE
PUBLIC ROAD INTERSECTION TEMPORARY WIDENING N.T.S.
ACCESS ROAD / PUBLIC ROAD
PUBLIC ROAD
TEMPORARY CONSTRUCTION INTERSECTION WIDENING
PUBLIC ROAD INTERSECTION : ACCESS ROAD CUT-THROUGH TEMPORARY WIDENING N.T.S

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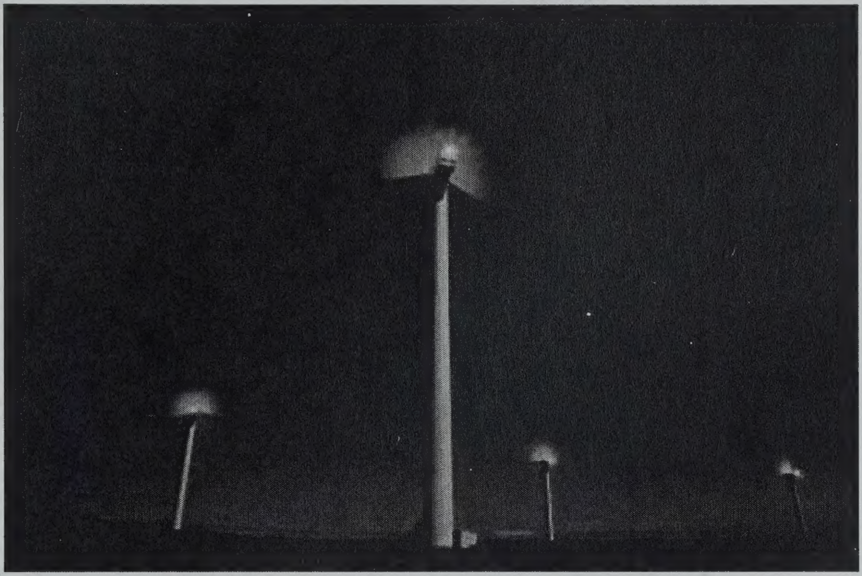
[15] http://ga.water.usgs.gov/edu/waterproperties.html

[16] http://www.wind-watch.org/news/2011/09/02/monster-trucking-routes-to-proposed-wind-farm-wont-whack-homes-or-hotels-shell-says/

Light pollution:

Borrego leads Dark Sky movement article UT 9-5-11:"*Scientists see light pollution as a waste of energy, and Circadian disruption as a threat to the food chain and human health*"



Spiddal turbines at night
These wind turbines overlook Galway in the west of Ireland - photo by John Smyth (http://johnsmyth.ie/blog/?p=3) [17]

The DEIS/EIR does not adequately address the noise, light, traffic, vibration, and other adverse impacts on the wildlife resources they are supposed to be protecting like Bighorn Sheep, a Golden Eagles, FTHL, American Badgers....where they supposed to go with so many industrial scale projects planned in the same condensed geographic area, linked habitats, and corridors and flyways?

O13-13

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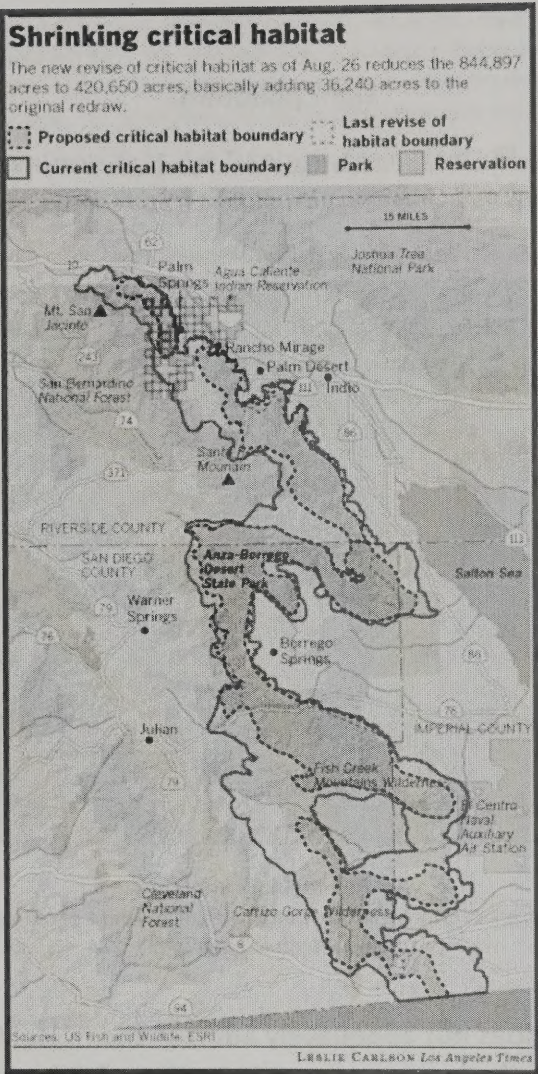
[17] http://wind-watch.org/pix/563



Shrinking critical habitat

The new revise of critical habitat as of Aug. 26 reduces the 844,897 acres to 420,650 acres, basically adding 36,240 acres to the original redraw.

Proposed critical habitat boundary
Last revise of habitat boundary
Current critical habitat boundary
Park
Reservation
15 MILES
62
10
Palm Springs
Agua Caliente Indian Reservation
Joshua Tree National Park
Mt. San Jacinto
Rancho Mirage
Palm Desert
Indio
111
243
San Bernardino National Forest
74
86
Sant
Mountain
371
RIVERSIDE COUNTY
SAN DIEGO COUNTY
Anza-Borrego Desert State Park
Salton Sea
Warner Springs
79
76
Borrego Springs
86
78
IMPERIAL COUNTY
Julian
Fish Creek Mountains Wilderness
79
El Centro Naval Auxiliary Air Station
Cleveland National Forest
Carrizo Gorge Wilderness
8
94

Sources: US Fish and Wildlife, ESRI

LESLIE CARLSON Los Angeles Times

When the Interior Department settled with the tribe in 2006, it invalidated the 2001 critical habitat and gave the U.S. Fish and Wildlife Service two years to gather data and redraw it. Advocates for the bighorn were shocked when the Fish and Wildlife Service finished its study and issued a map that cut the critical habitat by nearly half and left two populations isolated.

"I'm not happy with it. We had contiguous habitat . . . now there are three islands," said Esther Rubin, a member of the original Peninsular Bighorn Recovery Team.

Jim De Forge of the Bighorn Institute in Palm Desert said he worries that the development pressing into the former habitat will reverse the gains made by the group's captive-breeding program and other efforts to increase the bighorn population.

Bighorn sheep are easily disturbed by human activities, and are particularly susceptible to communicable diseases carried by pets and livestock. In the 1980s, De Forge said, 90% of lambs were dying from disease. From 1998 to 2001, 43% of lambs died from "urbanization," which includes automobile collisions, poisoning from ornamental plants, predation from increased coyote populations and illnesses caused by parasites that are common to residential development.

One population, known as the San Jacinto group, has only 13 ewes and is threatened by a proposed housing development called Shadow rock at the base of the Palm Springs Aerial Tramway.

Meanwhile, U.S. Gypsum Co. is applying for permits to expand its Imperial County operations into former critical habitat, according to the Bureau of Land Management. A final environmental impact report for the project was released in March. It included measures to restrict access to undisturbed land and to educate mine employees about avoiding sheep, and pledges to keep domestic animals and livestock away from bighorn areas.[18]

The CPUC should be involved as a Cooperating Agency for SDG&E's new project Substation as described in Plan of Development, but BLM staff comments at the August 25 "hearing" in Ocotillo indicate that the PUC was purposely excluded based on BLM's *experience* with the working with PUC on the Tule Wind joint DEIR/EIS. O13-14

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[18] http://www.biologicaldiversity.org/news/media-archive/BighornLAT9-2-08.pdf

__The POD states that:__ The proposed substation is located in a 31.7 acre parcel adjacent to the proposed SPL transmission line. The size of the substation is approximately 4.2 acres. The major substation components include circuit breakers, 2 34.5/500 kV step-up transformers, overhead electrical bus work, switches and controls, a control building, and capacitor banks and the entire substation yard will be enclosed inside a security fence.

The proposed SDG&E 500kV switchyard is adjacent to the proposed substation and will be connected to both the proposed Project substation and the SPL transmission line via a short overhead transmission line, approximately 200 yards in length. In addition, a 50 yard overhead transmission line will connect the switchyard and substation. Both the proposed substation and switchyard are located in the 31.7-acre parcel described above. The size of the switchyard is approximately 21 acres. The proposed switchyard may include circuit breakers, overhead electrical bus work, switches and controls, and a control building and the entire substation and switchyard area will be enclosed inside a security fence.

Both overhead and below ground transmission lines are proposed for the project. Overhead transmission lines will be limited to the short transmission line connection from the substation to the adjacent SDG&E switchyard and from the switchyard to the adjacent SPL transmission line. The remainder of the project will feature below-ground collection lines that will provide the connection between wind turbines and the substation. The collection lines are located adjacent to the proposed access roads and will be buried approximately 4 feet below the ground. At specific locations along the collection line, junction boxes are required to connect cable segments. Junction boxes will also be underground, and will be located adjacent to the road.[19] (emphasis added)

The BLM and Imperial County cannot and should not be allowed to purposely exclude the PUC as a legitimate cooperating agency for this project when the SDG&E Substation, and required Sunrise Powerlink Loop-In and full public review are part and parcel of Ocotillo Wind.

__CEQA Guidelines specify that a "project" means "the whole of an action...." (CEQA Guidelines, § 15378, subd. (a).)__ Further, the CEQA Guidelines clarify that the term "project" refers to "the activity which is being approved and which may be subject to several discretionary approvals by governmental agencies. The term 'project' does not mean each separate governmental approval. (CEQA Guidelines, § 15378, subd. (c).) These requirements ensure that a lead agency does not impermissibly "piecemeal" environmental review by chopping a single project into smaller parts for environmental consideration.

O13-15

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[19] http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/cdd/energy/pods0.Par.63352.File.dat/Ocotillo%20Draft%20POD%202%2028%2011%20clean%20(3).pdf

SDG&E not listed as a partner[20] EPA SF6 Emission Reduction Partnership for Electric Power Systems aimed at reducing GHG emissions.[21] Why not?

The most common use for SF6, both domestically and internationally, is as an electrical insulator in high voltage equipment that transmits and distributes electricity. Since the 1950's the U.S. electric power industry has used SF6 widely in circuit breakers, gas-insulated substations, and other switchgear used in the transmission system to manage the high voltages carried between generating stations and customer load centers.

Several factors affect SF6 emissions from electric power systems, such as the type and age of the SF6 containing equipment (e.g. older circuit breakers can contain up to 2,000 pounds of SF6, while modern breakers usually contain less than 100 pounds), and the handling and maintenance procedures practiced by electric utilities. Because of its long life span and high GWP potency, even a relatively small amount of SF6 can have a significant impact on our climate. **O13-16**

The SF6 Emission Reduction Partnership is one of EPA's voluntary industry programs aimed at reducing greenhouse gas emissions. The Partnership's primary objective is to reduce SF6 emissions via cost-effective technologies and practices. Through improvements in the leak rate of new equipment, refurbishing of older equipment, and the use of more efficient operation and maintenance techniques, utilities often find economical solutions to reduce SF6 emissions.

Extended comment period and Public Hearing requested for this highly controversial and unneeded industrial wind project

We are requesting that real public DEIS/EIR hearings be held jointly by BLM and the Army Corps in the most impacted rural community of Ocotillo in order to take public comment on the DEIR/EIS that BLM refused to do at their August 25 DEIR/EIS hearing, despite vocal request to do so. A public hearing in the impacted community would serve both the public and the ACOE with a sharing of knowledge about this beautiful at risk desert land that supports an amazing diversity of life and resources that deserve the same enforceable protection that has been in place over the last two decades or so. **O13-17**

Ocotillo Wind is a highly controversial project that will result in significant and cumulatively significant adverse impacts to a variety of critical resources within overlapping Areas of Potential Effect of numerous industrial scale wind, solar and transmission projects. **O13-18**

The Applicant's proposed export and long-haul groundwater from the federally designated Campo/Cottonwood Creek Sole Source Aquifer to the project site located within the Ocotillo /Coyote Wells Sole Source Aquifer, is reason enough to deny this project outright. **O13-19**

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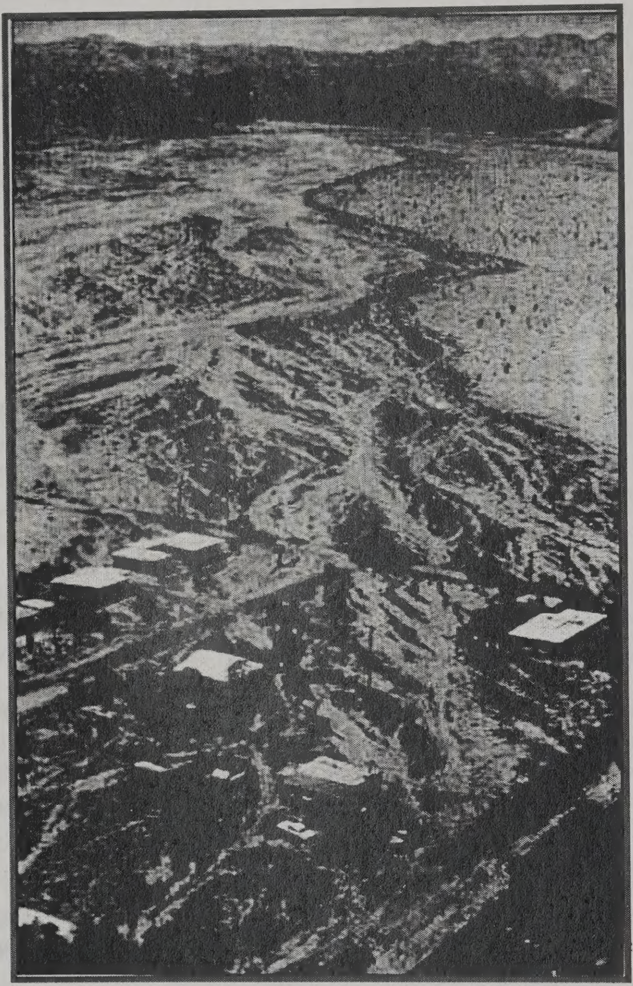
[20] http://www.epa.gov/electricpower-sf6/partners/index.html

[21] http://www.epa.gov/electricpower-sf6/basic.html

Many of us have not forgotten the devastation that Hurricane Kathleen wrought on the local human and natural communities in the Ocotillo area and surrounding region, wiping out sections of I-8, the railroad, and the community of Ocotillo, as documented in photo below. Placing industrial wind turbines in the same flood-prone area and altering natural washes is a well justified and major concern.

O13-19, cont.



Kathleen's path is still evident today in the large empty space between homes in the community of Ocotillo.

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[22] http://commons.wikimedia.org/wiki/File:Damage_from_hurricane_kathleen.JPG

Lack of need for controversial and damaging rural commercial industrial projects that require expensive new infrastructure, and generate increased risks:

The excerpt below was taken from the linked Energy Projects West article: **CALISO grapples with Renewables Glut in the Queue** (7.19.11):
http://www.nytimes.com/2011/06/16/science/earth/16solar.html?_r=2&emc=eta1

"Cal-ISO is looking at ways to deal with 71,000 MW of renewable generation in its interconnection queue, which is more than three times the additional renewables capacity needed to meet California's 33-percent renewable energy target. The state has about 7,600 MW of renewables capacity in operation, and only an additional 20,000 MW is needed to meet the 33-percent renewables portfolio standard..."

1. **As of July 20th, there were 655 MW of renewables in the Cal-ISO queue for connection at the Boulevard Substation: # 32, 106A, 555, 583, 789, 794, 653ED.**
2. **Another 221.75 MW is in the queue to connect to the Borrego Substation.**
3. **Another 1,160 MW is in the queue to connect to SDG&E's proposed ECO Substation in Jacumba .**
4. **Another 6,105.45 MW is in the queue to connect to SDG&E's Imperial Valley Substation, where both of SDG&E's 500 kV lines are connected, along with their cross-border La Rosita 230kV lines.**
5. Several more projects are listed in the Imperial Valley queue but do not show their proposed capacity.
6. How reliable will the grid be when a single natural disaster could wipe out that one overloaded energy hub?
7. **Link to the referenced July 20th Cal-ISO queue:** http://www.google.com/#sclient=psy&hl=en&site=&source=hp&q=CAISO+queue&rlz=1W1ADRA_en&aq=&aqi=&aql=&oq=&pbx=1&bav=on.2,or.r_gc.r_pw.&fp=e01c281917b6b230&biw=1920&bih=901
8. In addition to constructing the controversial and disputed Sunrise Powerlink (currently in the 9th Circuit), SDG&E appears to be following the top ranked All-Source Generation Alternative as described in the Sunrise Powerlink Final EIR/EIS, and pointed out in the Proposed Decision by the PUC's assigned Administrative Law Judge Vieth, recommending denial of the CPCN for Sunrise Powerlink.
9. The in-basin all generation alternative (diverse mix of renewables with peaker plants and storage backup) was promoted in Bill Power's well-researched Smart Energy 2020 Plan: http://www.etechinternational.org/new_pdfs/smartenergy/52008_SmE2020_2nd.pdf

O13-20

Distributed Generation projects, at or near the point of use, that we can support:

O13-21

- SDG&E's linked sustainable communities projects include examples of on-site projects that we can support: http://www.sdge.com/environment/sustainablecommunities/solarProjects.shtml, http://www.sdge.com/environment/sustainablecommunities/completedProjects.shtml
- San Diego military bases are also installing on-site renewable and energy efficiency projects : http://www.cleanenergyauthority.com/solar-energy-news/california-marine-base-goes-solar-062411/
- According to Solar-California, 90 MW of solar has been installed in the city of San Diego .
- New construction in San Diego County is also going green, like San Diego County's new LEED operational building with solar covered parking structure: http://www.electricrates.com/36518/san-diego-solar-energy/
- 1 MW of solar is also being installed on canopies on the parking lot at the County's Otay Mesa Detention Facility http://www.signonsandiego.com/news/2011/jul/25/solar-power-system-planned-otay-mesa-detention-fac/
- San Diego County has a Green Building incentive program to help reduce costs and GHG emissions: http://www.sdcounty.ca.gov/dplu/bldg/green.html
- Borrego Solar has installed numerous Distributed Generation urban projects that our groups support: http://www.borregosolar.com/solar-projects/southern-california/
- Hickam Air Force base in Hawaii is installing 5 MW of solar panels on 600 residential roofs. It can be done: http://www.solarmash.com/news/2011-07-22/hawaii-air-force-base-combines-utility-scale-and-residential-solar--16245/
- Even New Jersey installed 40 MW of capacity with 520 solar projects in June of this year: http://solar.coolerplanet.com/News/800559981-june-a-record-month-for-solar-power-installations-in-new-jersey.aspx
- The linked NY Times piece reports that two-thirds of New York City's rooftops are suitable for solar panels and could jointly generate enough energy to meet half the city's demand for electricity at peak period--used to create solar empowerment zones: http://www.nytimes.com/2011/06/16/science/earth/16solar.html?_r=2&emc=eta1, http://nycsolarmap.com/

O13-21, cont.

SDG&E also proposes adding 450 MW of local peaking gas-fired peaker plants to bolster fluctuating renewable energy and maintain reliability :

- SDG&E's Advice Letter states that this PPA will not require the use of substitute system energy from unspecified sources other than through the CAISO PIRP arrangements.
- The CAISO queue, as of July 20th, also shows 397 MW of Natural Gas fired power plants proposed in SDG&E territory and another 97.3 MW on the list is shown as active.
- **Excerpt below is taken from this linked PRNewswire article dated May 31, 2011 on SDG&E adding another 450 MW of peaker power[23] :**

"Smaller Generators to Bolster Reliability During Periods of High Demand SAN DIEGO, May 23, 2011 /PRNewswire/ -- San Diego Gas & Electric (SDG&E) announced today that it has filed for regulatory

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[23] http://www.prnewswire.com/news-releases/sdge-proposes-adding-450-mw-of-local-peaking-power-122455188.html

approval of three new power-purchase contracts for a total of 450 megawatts (MW) of quick-start generation from peaker plants proposed for San Diego County. Peaker plants are small, efficient power units that can reach full generating capacity within 10 to 15 minutes to meet immediate demand on the grid.

" The new plants – Pio Pico Energy Center, LLC (Apex Power Group); Quail Brush Generation Project (Cogentrix Energy, LLC); and Escondido Energy Center, LLC (Wellhead) – are the selected projects that met the specifications of SDG&E's 2009 solicitation for conventional generation.
"SDG&E continues to sign contracts for as much renewable power as we can get to meet the state's 33-percent mandate, but we also need resources that can be brought online quickly to provide power when other sources, such as wind or solar plants, are not available," said James P. Avery, SDG&E's senior vice president of power supply.
"The output from most kinds of renewable generation fluctuates throughout the day, posing a challenge for our system operators who must balance supply and demand every few seconds to maintain reliability in the region," Avery added.
In addition to helping to integrate renewables with other generation sources, the new peaking units also will be called on when demand for power is highest, such as on a hot, summer day..."

Alarming Lack of Federal Agency Self-Control /Enforcement & Lack of Oversight and Enforcement of Approved Projects, Construction, and Mitigation Monitoring Compliance--does not bode well for impacted Ocotillo/No Mirage community and resources

O13-21, cont.

Example 1: Unlawful approval of the Sunrise Powerlink without full or proper surveys, analyses , public discloser or review,(currently in 9th Circuit Ct), resulting in numerous Project Modifications, Variances[24] and lax construction oversight resulting in cumulatively significant adverse impacts to people, places, wildlife and significant cultural resources[25], that are creating hazards and hardships[26]

Example 2: DOI's failure to provide responses to written requests from Boulevard Planning Group for an investigation into the cause of the catastrophic failure at Kumeyaay Wind prior to considering or approving any more turbine projects on federal lands--despite reports from the Campo tribal chair that DOI/BIA have reportedly visited the site and looked into the situation.

Example 3: The current US Customs and Border Patrol complex construction project in Boulevard, CA under the authority ACOE. Col Toy is allowing Straub Construction to continue to use an unauthorized water source from within the Campo /Cottonwood Creek Sole Source Aquifer--despite 3 San Diego County Codes Enforcement actions and the attached Civil Penalties Notice and Order against the owner of the water source, and intervention by Congressman Hunter's office. This is unworthy, unethical, and totally unacceptable. If this is the way the ACOE conducts business, and treats priceless finite resources, and impacted low-income communities and property owners, public perception of ACOE's will go further downhill rapidly.

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[24]

[25] http://www.cpuc.ca.gov/environment/info/aspen/sunrise/reports.htm

[26] http://www.cpuc.ca.gov/environment/info/aspen/sunrise/stop_work_order_092711.pdf

BLM appears to have forgotten that NEPA's fundamental policy is SUPPOSED to *"encourage productive and enjoyable harmony between man and his environment.*

O13-22

:"Is In the statute, Congress "recognizes that each person should enjoy a healthful environment and that each person has a responsibility to contribute to the preservation and enhancement of the environment. "

The following goals, set forth in NEPA, make clear that attainment of environmental justice is wholly consistent with the purposes and policies of NEPA

to "assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings"

to "attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences"

to "preserve important historic, cultural, and natural aspects of our natural heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice"

to "achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities. "These goals are promoted through the requirement that all agencies of the Federal government shall include in every recommendation or report on proposals for legislation and other...[27]

BLM must comply with NEPA (42 USC 4321 et seq.) ***that "requires Federal agencies to assess the impacts that their actions may have on the environment. BLM's discretion to issue the permits necessary for project construction and implementation requires that BLM assess the potential environmental effects of the Proposed Action and describe them in an environmental document" .***

O13-23

THE VERY REAL ADVERSE IMPACTS OF TURBINE GENERATED NOISE AND LOSS OF PROPERTY VALUES FLY IN THE FACE OF INDUSTRY AND GOVERNMENT AGENCY DENIALS AND THE EVIDENT UNSUPPORTED SEE NO EVIL;HEAR NO EVIL SPEAK; NO EVIL MANTRA

O13-24

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[27] http://www.epa.gov/compliance/ej/resources/policy/ej_guidance_nepa_ceq1297.pdf
http://www.epa.gov/compliance/resources/policies/nepa/cumulative.pdf

Wednesday, October 05, 2011

Can turbines generate health problems?

By LOU WILIN STAFF WRITER The Couriour.com (Findlay, Ohio)

Living close to wind turbines can hurt your peace of mind, job performance and health, according to some health experts and researchers.

"If you're within a mile, you're asking for trouble," said Alex Salt, an otolaryngology professor at Washington University in St. Louis.

Air Energy TCI, a company which plans to erect wind turbines between Arcadia, Fostoria and New Riegel, would locate some within one-third of a mile of a home, the company's development manager, Rory Cantwell, said Tuesday. He said Air Energy's standard exceeds the state standard by more than 500 feet.

"(Wind turbines) don't emit enough noise to do any permanent damage," said Brett O'Connor, operations director for TCI Renewables in North America, the parent corporation of Air Energy. "All thoroughly peer-reviewed, properly conducted scientific analysis has concluded that there is no impact to human health."

But Salt, who has studied the ear for 37 years, said wind turbines can, and do, cause some people problems. He has company.

In her book, "Wind Turbine Syndrome," Dr. Nina Pierpont of Malone, N.Y., tells about some neighbors of wind turbines experiencing ear and health problems.

Sleep disturbance, memory and concentration problems, headaches, dizziness and nausea, and ringing or buzzing in the ears are among their troubles, Pierpont said. Those problems can lead to further health deterioration, said Pierpont and Salt: high blood pressure and heart palpitations.

"There are really distinct effects on susceptible people," Pierpont said. "You just can't function in this. It's like you're wading through mud mentally. You're sick."

Susceptible are those older than 50; those with migraine disorder, motion sensitivity, and existing inner ear damage from, say, exposure to industrial or military noise, and toddlers and early school-age children, she said.

Wind turbines produce low-frequency sounds, which the industry says cause no trouble because people do not hear them.

"That's absolutely false," Salt said. "The ear is designed so you don't hear low-frequency sounds, but it isn't insensitive to them. Those sounds are still going in and they are still being transfused. Even though you don't hear it, it wakes you up."

Salt said people over time have adapted to not notice their own body's low-frequency sounds, like breathing and heartbeat. But when it comes to wind turbine sounds, sooner or later the brain notices they come from outside the body, and that's when the trouble starts, Salt said.

For some, the trouble starts within a few weeks. For others, it happens immediately.

"People have difficulty describing the problem they're having. It's not a sound you're hearing. It's an uncomfortable feeling in your ears," Salt said. "It's a perceiving. You're not hearing. It's a fullness or a stuffiness in your ear."

"It's an odd feeling," he said. "It's close to motion sickness."

Unfortunately, by the time residents experience problems, the wind farm has set up shop and enlisting its help is difficult, said Carmen Krogh, a board member for the Society for Wind Vigilance in Killaloe, Ontario. Wind turbines are more pervasive in Ontario than in Ohio.

"Once the turbines are established, it's hard to get any kind of resolution to health troubles," she said. The health of those affected can deteriorate while they battle for years with a wind turbine company, Krogh said. Some people have abandoned their homes, rented elsewhere or moved in with a relative, she said.[28] (emphasis added)

Compelling news video interview of homeowners impacted by industrial wind turbines[29]

EXPLICIT CAUTIONARY NOTICE

TO THOSE RESPONSIBLE FOR WIND TURBINE

SITING DECISIONS

Including Specifically Directors of Wind Developers, Publicly Elected Officials from Federal, State and Local Government, and Bureaucrats in Relevant Departments

BE ADVISED that, as a result of information gathered from the Waubra Foundation's own field research, and from the clinical and acoustic research available internationally, ***the following serious medical conditions have been identified in people living, working, or visiting within 10km of operating wind turbine developments.*** The onset of these conditions corresponds directly ***with the operation of wind turbines:***

- chronic severe sleep deprivation;
- acute hypertensive crises;
- new onset hypertension;
- heart attacks (including Tako Tsubo episodes);
- worsening control of preexisting and previously stable medical problems such as angina, hypertension (high blood pressure), diabetes, migraines, tinnitus, depression, and post traumatic stress disorder;
- severe depression, with suicidal ideation;
- development of irreversible memory dysfunction, tinnitus, and hyperacusis.

Other symptoms include those described by Medical Practitioners such as Dr Amanda Harry, and Dr Nina Pierpont in her landmark Case Series Crossover Peer Reviewed Study (submission No 13 to the Australian Federal Senate Inquiry into Rural Wind Farms) and published in Dr Pierpont's book entitled "Wind Turbine Syndrome, A Report on a Natural Experiment", 2009, published by K-Selected Books, Santa Fe.

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[28] http://www.thecourier.com/[illegible]

[29] Electricity nightmares: August 14, 2009: "We expose the truth about Australia's green energy revolution as we meet people bombarded by turbines making them sick and sending their house value plunging". http://video.au.msn.com/watch/video/electricity-nightmares/[illegible]

These serious health problems were also identified by Australian GP Dr David Iser in 2004. Dr Iser formally notified the Victorian Government of the time after his patients became unwell following the start up of the Toora wind project. His warnings were ignored without being properly investigated by the authorities and politicians.

All this and supportive material has been made available to the Boards of the major developers, State Ministers for Health and Planning and senior health bureaucrats. The time for denial, and of using the Clean Energy Council to shoulder the increasingly difficult task of denying the link between adverse health and operating wind turbines, is over.

At the Toora and Waubra wind projects, some seriously ill affected residents have been bought out by the developers, but only after they signed confidentiality agreements specifically prohibiting them from speaking about their health problems. This buy-out activity would support a conclusion that developers are aware of the health problems.

Meanwhile, wind developments have continued, with developers asserting that their projects meet acceptable standards, and thereby implying that they cannot be causing health problems.

The Foundation is also concerned that Vibroacoustic Disease, as recorded and described by Professor Mariana Alves-Pereira's team from Portugal, will develop in people chronically exposed to wind turbines. The disease has already been identified in the occupants of a house with levels of infrasound and low frequency noise identical to levels the Foundation is recording in the homes of affected residents in Australia.

The Foundation is aware of over 20 families in Australia who have abandoned their homes because of serious ill health experienced since the turbines commenced operating near their homes. Most recently, five households from Waterloo in South Australia have relocated, where the larger 3 MW turbines have had a devastating impact on the health of these residents. Some of these people have walked away from their only financial asset, to live in a shed or a caravan on someone else's land.

The Foundation notes the mid-2010 advice from the National Health and Medical Research Council that a "***precautionary approach***" be followed. We are not aware that either industry or planning authorities have adopted this exceedingly valuable and important advice.

The Foundation's position, as the most technically informed entity in Australia upon the effects of wind turbines on human health, is this: ***Until the recommended studies are completed, developers and planning authorities will be negligent if human health is damaged as a result of their proceeding with, or allowing to proceed, further construction and approvals of turbines within 10km of homes. It is our advice that proceeding otherwise will result in serious harm to human health.***

We remind those in positions of responsibility for the engineering, investment and planning decisions about project and turbine siting that their primary responsibility is to ensure that developments cause no harm to adjacent residents; and, if there is possibility of any such harm, then the project should be re-engineered or cancelled. To ignore existing evidence by continuing the current practice of siting turbines close to homes is to run the dangerous risk of breaching a fundamental duty of care, thus attracting grave liability.

The Waubra Foundation, 29 June, 2011; Enquiries: Dr Sarah Laurie, Medical Director, 0439 865 914; Email address: sarah@waubrafoundation.com.au[30]

Waubra resident tells court of wind farm "hell"

18 Jan, 2011 12:00 AM

Former Waubra resident Trish Godfrey yesterday told an Adelaide court how her dream home became "hell on earth" after wind farm turbines were turned on.

Ms Godfrey said she suffered sleep deprivation, headaches and nausea before moving out in April 2010 when Acciona purchased her property.

"It was like you had a hat on that's too tight and you have a pain that just gets worse and worse, and you can't take it off," Ms Godfrey said. "There was pain most of the time."

Ms Godfrey broke down in tears as she gave evidence at the Environment Resources and Development Court.

Dairy farmer Richard Paltridge is appealing a decision to grant Acciona approval to build a 46-turbine wind farm near his property, south of Mt Gambier.

Ms Godfrey said her symptoms began about a month after turbines were turned on, then got progressively worse.

"I said to my husband I'm not sick but I don't feel well," she said.

"It felt like I had a cold coming on all the time.

"My sleep patterns were changing. I was waking up two, three, four times a night. I couldn't explain it. I couldn't get my head around what was going on.

"You put it down to everything but what it is."

Ms Godfrey said she and her husband Victor, a dental surgeon, went on holiday to Darwin and the symptoms stopped, then resumed when she returned home.

"You get back and it starts all over again," she said. "It all came back with gusto."

Under questioning by George Manos for Mr Paltridge, Ms Godfrey said the 10-acre property was her "dream" home, where she and her husband intended to retire.

She said she planted 750 to 1000 boundary trees, about 30 fruit trees and 17 vegetable beds in the 10 years they lived there.

Ms Godfrey said she had been led into a false sense of security in a meeting with David Shapiro of Wind Power, the company that set up the Waubra project and sold it to Acciona.

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[30] http://www.waubrafoundation.com.au/[illegible]

"He told us there would be a couple of turbines on Quoin Hill, a couple on Big Hill and a few behind us," Ms Godfrey said.

"He said there would be no lights, no wires and no noise."

Ms Godfrey said 63 turbines could be seen from her property and it became "hell" to live there.

She said the noise "pressed in" on their home. "It was anywhere from a low whooshing sound, a sweeping swoosh some days, and when the wind was coming from the north it was like a jumbo jet in the back paddock," she said.

Former Waubra resident Carl Stepnell told the court yesterday he and his wife's symptoms of chest pains, heart palpitations and sleep deprivation ceased after the couple moved away from the family farm to Ballarat in November.

"We feel as though we've got our health back," Mr Stepnell said.

Mr Stepnell said his wife also suffered depression while living close to the turbines.

"Her whole appearance ... it was scary to see how bad she was," he said. "She was really down, depressed ... shocking."

Mr Stepnell said his five-year-old son attended Waubra Primary School until the family moved.

"I see a big difference in his behaviour," he said.

"He is nowhere near as emotional ... he was pale. (Now) he's like a normal five-year-old." [31]

Video interview on noise impacts to animals:

http://www.nonoise.org/library/animals/litsyn.htm

Susan King Reacts To Wind Turbine Fire On Her Taylor County Ranch

By Cassandra Garcia, KTXS News

POSTED: 7:42 pm CDT October 3, 2011 UPDATED: 8:13 pm CDT October 3, 2011

ABILENE, Texas – Texas State Representative Susan King is speaking out about the fire on her Taylor County ranch that was sparked by a wind turbine. Just after 10 o'clock Sunday night, Buffalo Gap, View and Ecca Volunteer Fire Departments responded to a fire at the Taylor County ranch of Texas House Representative Susan King. They used eight trucks to quickly contain the fire to about 2 acres. Monday, King said it's that timely response that has her looking at how their services can be repaid."They leave their families in the middle of the night. They're willing to do it for zero. They do assist them from time to time but in no way is it enough. I think with the drought we need to take a hard look at how we pay these people, not with their salaries, but paying for fuel or access to water and equipment," said King.

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[31] http://www.thecourier.com.au/news/local/news/general/waubra-resident-tells-court-of-wind-farm-hell/2319826.aspx

Now, she's looking into how she can take last night's scary experience and shed light on what she calls "silence" in a very young energy sector."I'm watching a turbine on my land on fire, throwing fire balls on my property. I think it needs to be very clearly delineated: if you have property and machinery that is the source of a fire that damages someone land or uses someone's resources who is responsible for the cost," said King. Volunteer fire departments do not bill for the cost of these types of accidents but always urge companies to donate. KTXS spoke to Next Era Energy Monday who told us in a statement "We have supported each of these volunteer fire departments in the past financially to help them purchase needed equipment because we recognize the important work that they do."We wanted to find out more, so we asked Ecca Volunteer Fire Department about those donations, they told us that they haven't gotten help from Next Era in about 4 years..."[32] (emphasis added)

Another wind turbine sparks fire

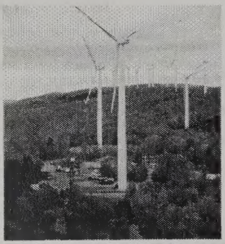
By Denise Blaz: blazd@reporternews.com

"...Volunteer firefighters from the Elm Creek Citizens Association, Buffalo Gap and View worked to put out the blaze, which fire officials said sparked a grass fire. The fire on the wind turbine itself was not able to be extinguished because of its height, said ECCA Fire Chief Gary Young. ***Young said firefighters faced hazardous conditions as the turbine began scattering debris on the ground. "I would gather that the turbine was spraying out debris up to three football fields," Young said. "Especially in an area like that, it was challenging because of the rough terrain. By nature, those are not good conditions for a fire."*** Young said fire crews remained on the scene until 4 a.m. to ensure that no flare-ups would occur under cedar trees, which are known to build a carpet of needles on the ground. The fire is the second in the past six weeks in the Callahan Divide wind farm, which contains 74 turbines. A previous blaze was reported Aug. 25 in the same area. A spokesman for NextEra Energy, the company that owns the turbines, called the fires unusual. "We have had two fires in a relatively short period of time," said Steve Stengel, the NextEra representative. "Fires of this nature are very unusual. This week we expect to have a crane at the facility to take down the turbines to try to finalize things."...[33] (emphasis added)

Wind energy and radar: A National Security Risk

(Posted September 24, 2011)

U.S. air space has been made less safe by turbines and our national security compromised because of a reckless policy of siting wind towers within 50-miles of radar installations. Military radar experts in the field know the damage that's been done. But with the debate surrounding energy policy dominated by politics and money, the military has bowed to the pressure.



Military leaders are under pressure to not disrupt White House green energy policies even while green energy technology is disrupting our navigation aids and impairing U.S. national security.

Washington has a track record of muzzling military testimony to protect its pet policies and political friends. Last week, Air Force Gen. William Shelton admitted he was pressured by the administration to change his testimony regarding LightSquared's network and its adverse impact on military space-based navigation systems. We applaud Shelton for not backing down.

But the military has not been honest about the effect wind turbine technology has on our national radar systems.

The fact is that our air space has been made less safe by turbines and our national security compromised because of a reckless policy of siting wind towers within 50-miles of radar installations. Military radar experts in the field know the damage that's been done. But with the debate surrounding energy policy dominated by politics and money, the military has bowed to the pressure.

Radar interference and mitigation

The military services and federal agencies have conducted numerous studies on the radar question, as have multiple international military and private interests. Not all studies agree on levels of severity and potential mitigations, but all agree that large scale industrial wind turbines have the potential to negatively affect military installations, radar, and navigation aids.

The problem is easy to explain, but difficult to resolve.

Since radar technology is designed to detect moving objects, spinning turbine blades create interference which degrades the signal. Wind towers carry a signal strength greater than a Boeing 747, so when the radar repeatedly sees the large return it cannot detect actual aircraft in the same area.

Large expenditures of time and funds have been allocated in pursuit of technical mitigations but so far the results are controversial. According to Raytheon lead radar engineer, Peter Drake, radar mitigation technology does not yet exist. "...These things [turbines] inside of 20 miles, look like a 747 on final approach," Drake said. The trick, he adds, "...is to somehow make them disappear, while still being able to see a real 747...we have not figured that out yet."

By 2008, nearly 40% of our long-range radar systems were compromised by wind turbines. Today, more than twice the wind capacity is installed and the problem of radar interference persists.

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[32] http://www.ktxs.com/news/29578076/detail.html

[33] http://www.reporternews.com/news/2011/oct/03/wind-turbine-sparks-up-southwest-of-abilene/

Proper siting of turbines, while politically cumbersome, is the only tried and true form of mitigation. But this means denying wind developers access to land areas covered by radar.

Radar interference at Travis Air Force Base

The problem of radar interference first cropped up in the United States in early 2007 near Travis Air Force base in California. Two wind proposals were before the Solano County Planning Commission that would erect over one-hundred new turbines in the area. The spinning blades resulted in smaller planes appearing to drop off the radar while others appeared when they weren't actually there.

Both Travis and the Solano County Airport Land Use Commission urged a delay in approving the projects, citing air safety and the need for more time to study the effects the towers had on navigation.

In his letter to the County, Colonel Steven Arquiette, commander of the 60th Air Mobility Wing at Travis warned the turbines would create significant interference with the base's radar and could lead to potentially serious flight safety hazards.

The county heeded their concerns and agreed to the delay. Commissioner John Moore was particularly firm when he said "...Nothing happens unless the Air Force's problem gets fixed."

Travis held firm on its objections until a year later when enXco, one of the project proponents gifted $3 million to the base for technical mitigations.

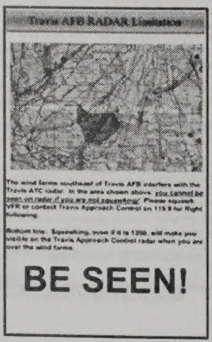
Col. Arquiette was told by his superiors to accept the money and withdraw his complaints despite the fact that the mitigation offered little more than a "detuning" of the radar signal to lessen the impact of the towers.

enXco's project was built but the radar problem was never resolved.

The Travis AFB Midair Collision Avoidance (MACA) pamphlet was updated this year with a warning that states the wind farms southeast of the base interfere with radar. Unless an aircraft is 'squawking' it can't be seen. See image on right or click here to access the MACA.

Squawking refers to turning the aircraft's transponder on to allow communication between the aircraft and the secondary radar system installed at air traffic control facilities.

The strategy of requiring areas to be transponder-only airspace could work but relies on pilots complying with the warning. Recreational pilots may not remember to comply or their aircraft



Travis AFB RADAR Limitation

The wind farms southeast of Travis AFB interfere with the Travis ATC radar. In the area shown above, you cannot be seen on radar if you are not squawking. Please squawk VFR or contact Travis Approach Control on 119.9 for flight following.

Bottom line: Squawking, even if it is 1200, will make you visible on the Travis Approach Control radar when you are near the wind farms.

BE SEEN!

might not be adequately equipped. And worse, drug runners or — in this post-9/11 world — terrorists, might prefer they not be seen. *The first thing the 9/11 hijackers did after seizing control of our passenger planes was to turn off the transponders.*

Remarkably, participants at the radar forum at AWEA's Annual Conference last May touted the Travis solution as the gold standard for mitigating turbine interference. You be the judge.

The radar problem at Travis involves airport surveillance radar. This type of radar is used by air traffic control and has a range of about 60 miles. Long range radar monitors in-route air traffic control used for homeland defense and NORAD. The mile distance for long range radar is distance of 250 miles.

A year ago, the unmanned Air Force radar facility located in Fossil, Oregon became the source of significant controversy when the Pentagon objected to the proposed $2 billion Shepherds Flat[1] wind energy facility. The project's 338 GE turbines totaling 845 megawatts would be built in the line of site of the radar sweep .

Fossil's radar monitors the U.S. border along the Pacific northwest including the territory north, over the Canadian border, and south into California.

Oregon Senators Ron Wyden and Jeff Merkley were outraged and tried pressuring the military into silence. They joined nine other senators in writing to Defense Secretary Robert Gates requesting a resolution of the conflict and insisting the Department failed to search hard enough for practical solutions.

Sen. Wyden also lobbied for $8 million in the 2011 appropriations to cover the cost technical mitigations akin to what was implemented at Travis.

Shepherds Flat wind and long-range radar

Outcome TBD

Windaction.org interviewed long-range radar specialists familiar with the mitigation proposed for the Fossil radar. The technology known as "Scan Step" involves installing a digital processor that, with software, will work to lessen the effect of turbine clutter. The process results in targets becoming invisible. In fact, aircraft the size of the space shuttle could fly through the radar swept area undetected.

The processor underwent its first test in the field last spring. Word back was that it failed all tests. None of the FAA or DOD engineers we've spoken to believe Scan Step technology will work in the way people have been led to believe. No one doubts there will be a loss in radar resolution. Critical questions still pending are: 1) What level of radar reduction will be deemed acceptable? 2) Who will decide the level of reduction that will be permitted? and 3) Will the public be informed as to the extent Shepherds Flat has compromised our national security?

When Windaction.org asked a staff member of the Senate Armed Services Committee what would happen if Step Scan didn't work, his response was an abrupt: "It has to"

Indeed! Shepherds Flat is slated to go in service in 2012.

The cases at Travis AFB and Fossil should raise red flags. But unlike the LightSquared example, the military is comfortable whitewashing the turbine issue and hiding behind technical mitigations that

don't work. Our national security and air safety have been compromised by wind turbines and U.S. taxpayers are unknowingly funding the degradation of our radar through federal renewable programs. It's time the military had the courage to step up and speak the truth to the American people.

1. The Shepherds Flat wind facility was the subject of the White House memo that complained the project received $1.2 billion in governmental subsidies covering 65% of the cost and risk for the project while its equity sponsors incurred only about 11% and an estimated return on equity of 30% – a hefty return for a project where the American public is absorbing the bulk of the investment risk. [34]

Sheffield wind turbine spills gear oil

"Workers Tuesday were to complete cleaning up 55 to 60 gallons of gear oil that spilled Saturday from a wind turbine generator high on a ridgeline in Sheffield.

The turbine is one of 16 recently installed by First Wind, a Boston company, which is constructing northern Vermont's first commercial wind farm. The turbines are being tested and have not begun generating power.

"Most of the oil spilled on the turbine itself and the gravel pad around it, but a small amount traveled 200 yards away," Chuck Schwer, head of the state's spill management program, said Tuesday... [35]

Turbine Noise destroying our lives/ livestock also impacted:

Nick Williams lives at Fullabrook itself with six of the turbines near his house. He claimed the wind farm had destroyed the area he lives in as well as his life.

He said: "It is like having tumble dryers in my bedroom and so I mostly have to sleep on the sofa in my front room – why should I be forced out of my bed?

"I can't afford to double glaze the whole house – why can't the people behind the turbines use this community fund to triple glaze all our houses? I have also had to buy a digital box for the television because the turbines interrupt the signal so badly it is impossible to watch."

Another resident, who wanted to remain anonymous, has lived at Halsinger for over 23 years and can see three turbines from her kitchen window. She said: "I can feel the sensation from the blades turning through my pillow when I am trying to sleep at night.

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[34] http://www.windaction.org/faqs/33117

[35] http://www.burlingtonfreepress.com/article/20110528/NEWS02/110528031/Sheffield-wind-turbine-spills-gear-oil

"There is no option of keeping the window open any longer. It is just too noisy to sleep – we were told they would be silent.

"And I have some chickens, I can't prove it is related, but they laid eggs everyday before July (when the turbines started to be tested) but since then we have had just two laid."

Kim Parker owns a stables with 15 horses at Pippacott and she believes the noise is a problem because it is unpredictable.

She said: "Most of the horses have got used to it now but it is not a constant sound so often unnerves them. Then they are jumpy and constantly looking up to where the noise is coming from."[36]

Ontario wind power bringing down property values

By John Nicol and Dave Seglins, CBC News

Posted: Oct 1, 2011 4:36 AM ET

Last Updated: Oct 2, 2011 3:56 PM ET

Wind turbines are shown near Port Alma, Ont., near the shores of Lake Erie. CBC News has documented scores of families who've discovered their property values are going downward. (Dave Chidley/Canadian Press)

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[36] http://www.thisisnorthdevon.co.uk/Turbine-noise-destroying-lives/story-13380066-detail/story.html

Wind power headaches

Beginning of Story Content

Ontario's rapid expansion in wind power projects has provoked a backlash from rural residents living near industrial wind turbines who say their property values are plummeting and they are unable to sell their homes, a CBC News investigation has found.

The government and the wind energy industry have long maintained turbines have no adverse effects on property values, health or the environment.

The CBC has documented scores of families who've discovered their property values are not only going downward, but also some who are unable to sell and have even abandoned their homes because of concerns nearby turbines are affecting their health.

"I have to tell you not a soul has come to look at it," says Stephana Johnston, 81, of Clear Creek, a hamlet in Haldimand County on the north shore of Lake Erie, about 60 kilometres southeast of London.

Johnston, a retired Toronto teacher, moved here six years ago to build what she thought would be her dream home. But in 2008, 18 industrial wind turbines sprung up near her property and she put the one-floor, wheelchair-accessible home up for sale.

"My hunch is that people look at them and say: 'As nice as the property is going south, looking at the lake, we don't want to be surrounded by those turbines.' Can't say that I blame them."

Johnston says she has suffered so many ill health effects, including an inability to sleep — which she believes stem from the noise and vibration of the turbines— that she now sleeps on a couch in her son's trailer, 12 kilometres away, and only returns to her house to eat breakfast and dinner and use the internet.

Industry rejects claims of lower land values

Meanwhile, the industry rejects claims of lower land values.

"Multiple studies, and particularly some very comprehensive ones from the United States have consistently shown the presence of wind turbines does not have any statistically significant impact on property values," says Robert Hornung of the Ottawa-based Canadian Wind Energy Association (CANWEA).

While acknowledging a lack of peer-reviewed studies in Ontario, Hornung says CANWEA commissioned a study of the Chatham-Kent area, where new wind turbines are appearing, and found no evidence of any impact on property values.

"In fact," says Hornung, "we've recently seen evidence coming from Re/Max indicating that we're seeing farm values throughout Ontario, including the Chatham-Kent area, increasing significantly this year as wind energy is being developed in the area at the same time."

However, Ron VandenBussche, a Re/Max agent along the Lake Erie shore, said the reality is that the wind turbines reduce the pool of interested buyers, and ultimately the price of properties.

"It's going to make my life more difficult," says VandenBussche, who has been a realtor for 38 years. "There's going to be people that would love to buy this particular place, but because the turbines are there, it's going to make it more difficult, no doubt."

Kay Armstrong says she felt fortunate to sell her two-acre property listed at $270,000 for $175,000. CBC

Kay Armstrong is one example. She put her two-acre, waterfront property up for sale before the turbines appeared in Clear Creek, for what three agents said was a reasonable price of $270,000.

Two years after the turbines appeared, she took $175,000, and she felt lucky to do that — the property went to someone who only wanted to grow marijuana there for legal uses.

"I had to get out," said Armstrong. "It was getting so, so bad. And I had to disclose the health issues I had. I was told by two prominent lawyers that I would be sued if the ensuing purchasers were to develop health problems."

Realtor association finds 20 to 40 per cent drops in value

Armstrong's experience is backed up in a study by Brampton-based realtor Chris Luxemburger. The president of the Brampton Real Estate Board examined real estate listings and sales figures for the Melancthon-Amaranth area, home to 133 turbines in what is Ontario's first and largest industrial wind farm.

"Homes inside the windmill zones were selling for less and taking longer to sell than the homes outside the windmill zones," said Luxemburger.

On average, from 2007 to 2010, he says properties adjacent to turbines sold for between 20 and 40 per cent less than comparable properties that were out of sight from the windmills.

Power company sells at a loss

Land registry documents obtained by CBC News show that some property owners who complained about noise and health issues and threatened legal action did well if they convinced the turbine companies to buy them out.

Canadian Hydro Developers bought out four different owners for $500,000, $350,000, $305,000 and $302,670. The company then resold each property, respectively, for $288,400, $175,000, $278,000 and $215,000.

In total, Canadian Hydro absorbed just over half a million dollars in losses on those four properties.

The new buyers were required to sign agreements acknowledging that the wind turbine facilities may affect the buyer's "living environment" and that the power company will not be responsible for or liable from any of the buyer's "complaints, claims, demands, suits, actions or causes of action of every kind known or unknown which may arise directly or indirectly from the Transferee's wind turbine facilities."

The energy company admits the impacts may include "heat, sound, vibration, shadow flickering of light, noise (including grey noise) or any other adverse effect or combination thereof resulting directly or indirectly from the operation."

TransAlta, the company that took over for Canadian Hydro, refused to discuss the specific properties it bought and then resold at a loss in Melancthon. But in an email to CBC, spokesman Glen Whelan cited the recession and other "business considerations" that "influence the cost at which we buy or sell properties, and to attribute purchase or sale prices to any one factor would be impossible."

Province says no change to tax base

Ontario's ministers of Energy, Municipal Affairs and Finance, all in the midst of an election campaign, declined requests for an interview.

'That's what makes them sick is that, you know, they'll get less money for their properties, and that's what's causing all this annoyance and frustration.'—*Environment Ministry lawyer Frederika Rotter*

A spokesperson for Municipal Affairs says his ministry has no studies or information about the potential impact wind turbines are having on rural property values.

However, last February, before an environmental review tribunal in Chatham, Environment Ministry lawyer Frederika Rotter said: "We will see in the course of this hearing that lots of people are worried about windmills. They may not like the noise, they may think the noise makes them sick, but really what makes them sick is just the windmills being on the land because it does impact their property values.

"That's what makes them sick is that, you know, they'll get less money for their properties, and that's what's causing all this annoyance and frustration and all of that."

When Energy Minister Brad Duguid declined comment, his staff referred CBC News to the Ministry of Finance, which oversees MPAC (the Municipal Property Assessment Corporation), which sets values on land for taxation purposes. They indicated that MPAC has no evidence wind turbines are driving down assessed values.

However, CBC found one household in Melancthon was awarded a 50-per-cent reduction in property tax because the house sat next to a transformer station for the turbines.

Losing the rural life

Almost all the people interviewed by the CBC rue the division between neighbours for and against the turbines, and said what they have lost is a sense of home and the idyllic life of living in the countryside.

Tracy Whitworth refuses to sell her historic home in Clear Creek. CBC

Tracy Whitworth, who has a historic home in Clear Creek, refuses to sell it and instead has become a nomad, renting from place to place with her son, to avoid the ill effects of the turbines.

"My house sits empty — it's been vandalized," says Whitworth, a Clear Creek resident who teaches high school in Delhi. "I've had a couple of 'Stop the wind turbine' signs knocked down, mailbox broken off.

"I lived out there for a reason. It was out in the country. School's very busy. When I come home, I like peace and quiet. Now, we have the turbines and the noise. Absolutely no wildlife. I used to go out in the morning, tend to my dogs, let my dogs run, and I'd hear the geese go over.

"And ugh! Now there's no deer, no geese, no wild turkeys. Nothing."

For the octogenarian Johnston, the fight is all more than she bargained for. She sank all her life savings, about $500,000, into the house, and she says she does not have the money to be able to hire a lawyer to fight for a buyout. But she is coming to the conclusion she must get a mortgage to try the legal route.

"I love being near the water and I thought, what a way to spend the rest of my days — every view is precious," she said, as tears filled her eyes. "And I would not have that any more.

"And that is hard to reconcile and accept."

Getting a mortgage on her house might not be that easy. CBC News has learned that already one bank in the Melancthon area is not allowing lines of credit to be secured by houses situated near wind turbines. In a letter to one family situated close to the turbines, the bank wrote, "we find your property a high risk and its future marketability may be jeopardized."[37]

Turbine developers on hook for fire protection

By Mary Golem

Wind energy developers in Arran-Elderslie now face more hurdles after council unanimously passed two bylaws at its meeting Monday.

The first bylaw deals with fire emergency responses for high-angle rescues at structures higher than 45.72 metres (150 feet).

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[37] http://www.cbc.ca/news/canada/ottawa/story/2011/09/30/ontario-wind-power-property-values.html

The bylaw calls for a certified copy of a valid service contract with a high-angle rescue service provider "who shall respond to any and all emergencies that may occur at the proposed structure."

"We don't have high-angle rescue equipment in Arran-Elderslie," Deputy-mayor Mark Davis said.

A wind energy developer "would have to prove to the municipality" that they have a contract with such a provider "before we'd even be able to consider issuing any (building) permit."

"It would be irresponsible for the Corporation of the Municipality of Arran-Elderslie to permit the installation of a tall structure in the absence of a dedicated high-angle rescue service for each such structure," the bylaw states. It also calls for a complete list "of any and all hazardous material(s) that may be contained within or be part of the construction of the proposed structure."

"We have to protect our residents," Davis said.

Council also adopted a copy of a bylaw, first passed by Huron-Kinloss, that outlines the minimum setback distance turbines must be from residential properties.

In Huron-Kinloss the setback is 1,200 metres, but Arran-Elderslie went even further and in their bylaw put in a distance of two kilometres or 2,000 metres.

"Any developer who tries to come to Arran-Elderslie with these things will have to meet these bylaw requirements first," Davis said.[38]

Wind Farm Whistle Blower: Sept 21, 2011 CBC Radio Interview with impacted homeowner, Barb Ashbee, in violation of a confidentially order signed when she and her husband were bought out by the wind turbine company (near their home), after the adverse health impacts to the Ashbees and their pets that commenced with the operation of the wind turbine project, could not be mitigated.[39]

Big fires mean big bills: disaster funding not automatic anymore[40]:

http://aeinews.org/archives/category/human-impacts

http://aeinews.org/archives/1293

http://aeinews.org/archives/322

New Study Will Analyze Wake Effect's Impact On Wind Turbine Productivity

by NAW Staff on Friday 09 September 2011

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[38] http://www.owensoundsuntimes.com/ArticleDisplay.aspx?e=3312836

[39] HTTP://WWW.CBC.CA/VIDEO/#/RADIO/LOCAL_SHOWS/ONTARIO/ONTARIO_MORNING/1752642480/ID=2150904019

[40] http://www.bakersfield.com/news/local/x710585568/Big-fires-mean-big-bills-Sorting-it-all-out-is-a-long-process

A Colorado-based research team recently completed a major study to learn more about the wake effect - one of wind power's biggest unknowns - and its impact on turbine productivity.

The study utilized Second Wind's Triton Sonic Wind Profiler, one of several remote sensing technologies that the Turbine Wake and Inflow Characterization Study used to create a detailed, 3D model of the turbulence caused when wind passes over rotating turbine blades.

The project's goal is to understand how to enhance wind farms' productivity, which can be undermined by turbulence that damages turbines downstream. For the project, turbine inflow and wake observations will be integrated into a wind energy forecasting model, Second Wind explains. Understanding how gusts and rapid changes in wind direction affect wind turbine operations will enable turbine manufacturers to improve design standards and increase efficiency, which will ultimately reduce the cost of energy, the company adds.

The study is aimed at capturing turbulence and other wake effects in a broad wedge of air up to 7 km (4.3 miles) long and 1 km (3,280 feet) high in front of and behind a multi-megawatt wind turbine.

Triton, along with tower-mounted sensors and other remote sensing systems, profiles the winds in front of and behind a 130-meter high wind turbine located at the National Renewable Energy Laboratory's (NREL) National Wind Technology center near Boulder, Colo. NREL, the University of Colorado at Boulder, the Cooperative Institute for Research in Environmental Sciences, and the National Oceanic and Atmospheric Administration have teamed up to conduct the study.

"Turbine wake effects are a huge unknown in the wind industry," says Second Wind CEO Larry Letteney. "To fully realize the potential of wind energy, with large-scale wind farms, we need to know how turbulence from one turbine affects those around it. We're confident that Triton will make a significant contribution to understanding wind farm conditions, which will lead to a more productive and efficient wind power industry.

What happened at the wind farm?

Credit: By Miriam Raftery, East County Magazine, eastcountymagazine.org 10 February 2010

GONE WITH THE WIND: 25 wind turbines damaged; witness saw explosive blue light before Campo-area wind farm went dark

"I saw a huge flash of blue out on the side of the hill where the windmills were. It started in the middle and spread out in all directions. It lit up the whole hillside the white-out of a snowstorm."–Ken Daubach, ex-firefighter, who witnessed the power go down

Battered by a winter storm on December 7, all 25 wind turbines at the Kumeyaay Wind project on the Campo Indian Reservation shut down—and haven't come back on line two months later.

At a January 28 public scoping meeting, Boulevard Planning Group Chair Donna Tisdale asked the California Public Utilities Commission and the federal Bureau of Indian Affairs to conduct a formal public health and safety investigation.

"All 75 blades from all 25 turbines were removed and only some of the FAA required lights are working," Tisdale wrote. "There is speculation that the high winds flowing across the composite blades created an electrostatic discharge that then arced between turbines damaging the blades and the electrical system."

Ken Daubach, a former firefighter, was driving home from work as a prison guard the night the damage occurred. "I was following a snow plough, very slow, doing maybe 5 to 7 miles per hour, heading westbound on I-8," he told East County Magazine. "I saw a huge flash of blue out on the side of the hill where the windmills were. It started in the middle and spread out in all directions...It lit up the whole hillside in a white-out of a snowstorm...Then it was all black."

Daubach and Tisdale express concern that such massive failure could pose danger to residents should it reoccur. The failure occurred when there was snow on the ground. But Daubach notes, "Had it been dry, I think we'd probably have had a fire."

In written comments provided to ECM, Daubach stated that SDG&E had a power outage in the area the day of the storm. He wonders whether a power surge following an outage might have caused the blue flash that he saw. He said Emmerton confirmed that "while rerouting power, they had inadvertently been taken off-the-grid that day, too. He admitted that they have no idea what is wrong."

Although an earlier news report speculated that the damage was caused by lightning, Daubach asid, "I didn't hear any thunder." According to the Union-Tribune, David Barnes, chief executive of Bluarc Management in Dallas, operator of the wind farm, has since acknowledged that no turbines were struck by lightning. "We're mobilizing equipment and spare parts to the site," Barnes told the Union-Tribune in a January 13 article, adding that workers are inspecting and repairing all 75 blades. He attributed high winds to the cracking, but has offered no public explanation of the flash seen by Daubach.

Daubach said he contacted Barnes in late January, and that it took considerable digging to locate contact information for the site operator. He says he also talked to a site manager, Neal Emmerton, and explained what he saw.

According to Daubach, he has also twice spoken with an engineer who works at the wind farm, whom he met into at a nearby gas station. "He said he was regenerating something inside at 10:30 that night—but his story changed; his original statement was that he was under the windmills at 10:30. Last time, he said he was just glad nobody got hurt. This was the worst possible failure, catastrophic failure...So what happened?"

In a written statement, Daubach noted that a controller for the wind farm said the manufacturer was "not being cooperative and that SDG&E had shut down the turbines numerous times due to putting in steel poles" and that "due to the insurance company and investors," the company needed to "get the turbines up and running quickly."

Barnes did not return calls from ECM. Campo Indians tribal chair Monique LaChappa also has not returned a phone message left yesterday. ECM will publish their comments if we receive responses.

The wind turbines are designed to stop spinning at wind speeds above 50 mph. Daubach estimated gusts of around 45 mph. "I can tell you it was moving my truck." Asked how often winds that strong are felt in the area, he replied, "Too often. At least once a month."

But Andy Degroot, who lives about a mile and a half from the wind farm, told ECM that he has a wind indicator—and it measured 75 mph wind speeds the night of the storm. "That's the highest we've recorded, and we've had that thing probably five years," he said. He photographed the wind speed measurement on his cell phone.

Degroot confirmed that he did not hear any thunder on December 7th, either.

Degroot told ECM that he went up to the wind farm the day after the blades stopped turning to check the damage.

"I walked right up there and got underneath them. A lot of the blades were split. Chunks were torn out of them," he said. "It was pretty severe damage," he said, adding that he did not see any burn marks on blades. He took photos of the damage, which he has shared with ECM. "Then I got kicked out," he recalled, adding that he did not see any no trespassing signs.

His photos showed severe damage, including one blade with one-third to one-half of its approximately 90-foot-length blade missing.

Photos also reveal what appears to be substantial oil leakage from machinery down the length of the massive tower. Pointing to the photo of an area where the substance was leaking from, he observed, "That's the size of a two-car garage, approximately. They're touting them as cheap, clean energy. They're not that clean."

Degroot said he did not observe any blades or portions of blades that had flown far enough afield to have damaged persons or property outside the wind farm, or on Interstate 8.

The night of the storm, something also happened to lights at the facility. "I'm looking at all 25 windmills right now," he said in a phone interview. "We have one that's closest to us that has a white strobe on it. It used to be red at night and now it stays white. When it's hazy outside and it blinks, it's a huge flash in the sky. After a while, it gets pretty annoying." He said he's talked to an employee who told him they are aware of the problem, but haven't gotten around to fixing it."

Tisdale revealed, "One wind farm employee told me that he cannot get permission to repair that light.

Degroot is worried that the catastrophe could reoccur. "I'm sure it could happen again because these are huge blades," he said. "They're like ninety-some feet long. I don't know what they changed on this new group that's going to be different than the old style."

Others share that concern. The consequences of a wildfire started in this windy backcountry region are all-too-well known, as the Cedar, Witch and Harris fires have proven. Those fires charred hundreds of thousands of acres and cost many lives.

The Harris fire started in nearby Potrero, where 100-mph winds swiftly fanned flames that forced evacuations as far east as Chula Vista and killed several people. The Witch Fire, also in 2007, began in mountainous Ramona and forced evacuation all the way to the coast in Solana Beach. Together, those fires and others ignited during the same Santa Ana windy period caused half a million people to evacuate—more than during Hurricane Katrina. The 2003 Cedar Fire, at the time the worst in California history, killed 17 people.

Tisdale cites concern over electrical arcing from turbines that extends beyond Campo. "What danger does this type of static discharge represent, especially if turbines are placed on public lands in recreation areas, and adjacent to private properties? " she asked in her request for an investigation.

She added, "How will the increased threat of fire and other damage from more turbines impact our insurance? Rates will like rise, and insurance will be denied to some homeowners," Tisdale predicted. "It is already hard to get insurance in this high fire danger area."[41]

What kind of turbines will be used??

If turbines don't create vibration problems why did GE by this equipment?

GE Acquires Vibration Analysis, Monitoring Equipment Company

by NAW Staff on Wednesday 24 August 2011

GE has announced the acquisition of Commtest, a producer of vibration analysis and monitoring equipment. GE Energy's Bently Nevada product line will incorporate Commtest products into its portfolio. Bently Nevada provides machinery protection and condition monitoring for wind farms, power plants and refineries.

"The acquisition of Commtest allows us to significantly upgrade our portable vibration data collection and analysis capabilities," says Art Eunson, general manager for GE's Bently Nevada product line[42]

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[41] http://www.wind-watch.org/news/2010/02/10/what-happened-at-the-wind-farm/

[42] http://www.nawindpower.com/e107_plugins/content/content.php?content.8455

http://betterplan.squarespace.com/ : videos of dairy farmer and chicken farmers with adverse impacts from wind turbines:

Story of a dairy farmer named Kevin Ashenbrenner whose farm is in the Shirley Wind project (Town of Glenmore, Brown County WI)

"He has lost 17 calves and 15 cows since the Shirley turbines started spinning, that's more than he loses in 5 years of farming and breeding. The closest turbine to his house is 9/10 mile away as the crow flies. There are six turbines total around his property. His family is also suffering badly with headaches, anxiety, and insomnia."

He says *"I had beef cattle for about two years prior to the turbines operating and never lost any animals. However, shortly after the turbines began to operate, I had beef cattle become ill and die. I reported this on the WPS hotline and nothing was done. I lost ten animals valued at $5,000 (each) over a two year period and couldn't afford to continue."*

(Source: Brad Yunks full testimony to the Public Service Commission of Wisconsin HERE)

After turbines in the Blue Sky/Green Field project went on line near the Town of Marshall in Fond Du Lac county, James Vollmer's chickens began to fail. His hatch rate plummeted and there were a high number of unusual deformities in the chicks that did hatch, including missing eyes, crossed beaks and missing leg bones.

Vollmer has been around chickens his whole life. His grandmother and grandfather raised poultry and he says he took to it right away. He has photograph taken by his grandmother of himself as a toddler in the chicken house with baby chicks nesting on his back. He says, "I can't remember a time in my life when I wasn't around chickens."

http://www.wind-watch.org/documents/my-personal-experience-living-in-a-wind-farm/

Author: Fraser, Helen

In this interview by Save Our Skyline Renfrew County (sosrenfrewcounty.wordpress.com), Helen Fraser talks about health issues she suffered after the Melancthon wind energy facility near Shelburne, Ontario, began operation in the spring of 2006. Her home, where she had lived for more than 30 years, ended up in the middle of the facility. Her fibromyalgia seriously deteriorated shortly after the wind turbines were active, yet improved just as drastically every time she was outside the vicinity of the facility. Mrs. Fraser also notes that they no longer saw the abundance of wildlife that they had before.

There were 12 turbines visible on three sides of her home, the closest only 423 meters away. Eight of the turbines had an obvious direct impact on the home, with noise or shadow flicker. "I could tell if the turbines were running if I had a headache," she says. When the towers were erected, she began having severe head and body aches, ringing in her ears, digestive issues, and chronic fatigue, which led to a whole host of other issues, including depression and not being able to concentrate. "And they all cleared up after 24 hours [of being away from home], and when we'd come back the symptoms would be there 24 hours later."

"There were major, major health issues for me, and since we've moved here [her new home, after a year and a half of 'pure torture'], nothing." Interview video is 21 minutes long

http://www.wind-watch.org/documents/helen-fraser-interview-melancthon-i-shelburne-ontario/

Author: Armstrong, Kay

When researching the impact the impacts of industrial wind turbines on migration of birds and bats, please consider the following:

I live in close proximity to a wind farm on the north shore of Lake Erie, the closest turbine being 460 meters from my property of 7.4 acres.

This wind farm is located in Clear Creek, Ontario and is comprised of 18 ~ 1.65 MW Vestas V82's.

It is an extension of the Erie Shores Wind Farm in Port Burwell Ontario, a wind farm that is comprised of 66 ~ 1.5 MW GE sle turbines.

I am relating my personal experiences to you so that you might have a background on the consequences of this wind farm.

My home is now virtually uninhabitable because of the infrasound and low frequency noise emanating from these turbines. We (the locals) also believe the turbines/substation is generating stray voltage, a matter we are having trouble in finding a government body for which to be held accountable. I do still live here, but only because I cannot afford the financial burden of an additional mortgage and property taxes.

Upon commission of the Clear Creek wind farm I started to exhibit many symptoms that could be identified with Wind Turbine Syndrome. Because of a layoff this past summer, I now spend each and every day at home. The ensuing constant, prolonged exposure, has caused my health to decline rapidly.

The following is an account of a particularly bad night:

I live in Clear Creek adjacent to the wind farm. Once again, I've been woken up by the turbines. I can hear the deep humming sound and I can feel the vibrations through my entire house. Both are even more detectable when I lay my head down to sleep. I can hear and feel them through my pillow.

I can also hear the sound of killdeer outside, and it occurs to me that this isn't the first time I've heard them at strange hours of the night. They seem especially agitated right now, and it strikes me that they, these birds that roost on the ground, are feeling what I'm feeling, perhaps to an even larger degree since they have direct contact to the ground. The vibrations have woken them up as well and they are flying around throughout the night in order to escape them. In fact, these poor creatures have it even worse than I do because they have to keep flying and expend energy in order to be free of the vibrations that are disturbing what they had deemed home for the night. These birds are going to be exhausted before migration even starts. With industrial wind farms from northern Ontario down through the States, where will these birds ever find a resting spot?

Another thing. There are no frogs in my pond this year. It takes 150 paces to circle my pond. It used to be with each step or so I could hear one jump into the water. I don't believe they could see me coming for all the bulrushes around the edges and with banks 5 to 20 feet high. They were able to detect my footsteps as I approached. It would be my guess that these vibrations are intolerable to them as well. Either that or the vibrations have stopped the eggs from developing. But they're not there anymore. Not one.

It's now past 3 AM; 4 hours later and the killdeer are still disturbed. If they don't sleep now and have to sleep in the day to compensate for it, how do they find time to gather the food they need?

This low-frequency/infrasound is making me dizzy, and the vibrations can be physically felt when I lay my head down. A couple of weeks ago, desperate for sleep, I actually went out to my truck at 4:30 AM, thinking the rubber tires would eliminate the vibrations. This actually worked, although you could still hear the hum and I was still dizzy. Tonight, the killdeer are up in the trees, calling to each other. I think in an attempt to do the same thing.

If this 'noise' can make a human skull resonate, make me dizzy, what does it do to the skulls of these killdeer and other small-framed animals? What does it do to their internal organs?

Three times I have traveled 20 km away on bad nights to escape these vibrations. On those nights I could still hear and feel the vibrations through the couch I slept on – 20 km away. I could tell they were from the wind farm because of their cyclic rhythm.

Although the impact of industrial wind farms on migration is necessary and commendable, it is my concern that not nearly enough attention is being paid to the seismic vibrations generated by these wind farms.

In addition to the above account, I have noted killdeer eggs in my driveway that never hatched.

There are alarming reports of fewer snakes in our area.

This in conjunction with reports of stillborn seals in the vicinity of offshore turbines, reports of pregnant women being hurriedly bought-out, silenced and gagged.

Having experienced these vibrations for myself, I really worry about the impact of industrial wind farms on the eggs of all creatures that reside on the ground, in the water; the impact on the environment as a whole.

Vibrations felt from 20 km away."[43]

"Council supports moratorium"

—Barbara Simpson, Simcoe Reformer 5/26/10

Waterford Councilman Harold Sonnenberg stole the wind out of Norfolk Council's sails last night, stating he will not be supporting any future industrial wind turbine projects.

His disdain highlights a change in direction about the alternative energy source in council chambers. Last night, Norfolk council approved a motion to support a moratorium on the erection of any industrial wind turbines until rigorous scientific research has been conducted. The county will be joining 58 Ontario municipalities and 410 European organizations of the European Platform Against Windfarms (EPAW) who are seeking a moratorium.

Stephana Johnston, whose home west of Port Rowan is surrounded by 18 wind turbines, presented the motion to council. She has been a regular on the council circuit lately, speaking out about the ill effects of wind turbines. She now maintains a space to clock some restful sleep in Delhi to the tune of $680 per month.

Her story of ill health — and similar stories throughout the community — are now starting to be acknowledged by council. Sonnenberg read from a prepared statement last night, listing off the reasons why he can no longer support wind turbines.

"I will not even put up my hand to receive as information," Sonnenberg said. "Why? Because it's lunacy with a capital 'L.'"

Essentially, the price of electricity will skyrocket with two systems of energy being funded, he said. He also pointed out that wind power continues to remain unreliable, depending on the whim of the weather.

"I'm not even going to mention the health effects, which a lot of upper-level politicians are turning their noses up at," he added.

However, Windham Councilman Jim Oliver suggested that there are about 400 fellow municipalities who are either not actively supporting the moratorium or are simply unaware of the issue.

"That too says something to me," he added.

Little concern over wind turbines could simply be chalked up to a lack of firsthand experience, said Simcoe Councilman Charlie Luke.

"I suggest that many, many, many, many in this province do not experience firsthand the effects people in this community and around the world face," he said, adding there was "no question in my mind" that there are undocumented health effects to wind turbines.

Johnston also similarly framed this lack of concern.

"That doesn't mean they disagree with it," she said, after her deputation. "They just haven't had the experience. These people (council) have had eight years of experience."...[44]

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[43] http://www.wind-watch.org/documents/wind-turbine-placement-must-consider-vibration-effect-on-animals/

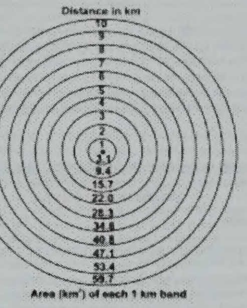
[44] http://www.windturbinesyndrome.com/news/2010/there-has-been-1-successful-suicide-and-1-suicide-attempt-ontario/

Why pro-wind studies often use a 10 km radius

Author: Salt, Alec

Last week I was reading of an Australian study, by a Professor Gary Wittert, which had shown sleeping pill usage for those living near wind turbines was no greater than the general population . The study compared those living within 10 km of turbines with those living more than 10 km away. There have been similar studies with property values using a 5 mile or 10 km radius that showed property values are not affected by wind turbines. Had you ever thought why they pick a 10 km radius?

Consider this graphic. It shows 1 km bands with the calculated area for each band shown in blue.



Let's keep it easy and assume that households are evenly distributed and there is one household for every 10 square kilometers.

So, within 2 km (the two innermost bands) of the turbine, the area is 3.1 + 9.4 km² (=12.5 km²) which would represent 1.2 households.

Now let's consider the two outermost (9 km and 10 km) bands. The area of these bands is 53.4 + 59.7 km² (=113.1 km²) which represents 11.3 households. So the outermost bands have about TEN TIMES the number of households of those living within 2 km, making sure that the contribution of the inner bands is diluted, swamped, covered up or however else you would describe it.

Or consider if you live within 2 km of a turbine. The outer bands of those living from 2–10 km from the turbine adds up to 301.6 km², which would represent 30.1 households – which is 24 TIMES the number of households within 2 km.

No wonder your voice is being "drowned out". The bigger the circle, the more "dilution" occurs.

Add this to the list of things where "size matters", and next time you see a study like this, consider the radius and area that was chosen. The choice of the circle size plays a major role in the result obtained and speaks volumes about the motivation of the author.

by Alec Salt, Professor, Department of Otolaryngology, Washington University School of Medicine[45]
via *Wind Concerns Ontario*

MasterResource

Ontario's Great Windpower Escape: A Setback Only

by Sherri Lange
August 4, 2011

..."Expect victories in the future. On the heels of this pro-wind decision that despaired many around the world tuned into this legal challenge, came Carl Phillips' release of an epidemiological study: *there are very real and verifiable health consequences for living too near turbines.*

More significantly, the publication of a whole peer-reviewed journal, with ten lines of evidence, from the likes of Dr Robert McMurtry, Order of Canada; retired Pharmacologist, Carmen Krogh; Alec Salt; Bob Thorne; Martin Shain; and John Harrison, has put health consequences in the middle of the wind power siting debate. (The special edition on turbine effects and human health is here.):http://www.masterresource.org/2011/08/ontario-wind-power-escape/

http://[illegible].blogspot.com/
Wind fall documentary trailer link:

http://www.youtube.com/watch?v=[illegible]&feature=player_embedded

Britain Evaluates Capacity Payments for Back-Up Generators to Wind Power Wind
Posted July 6, 2011

http://www.instituteforenergyresearch.org/2011/07/06/britain-evaluates-capacity-payments-for-back-up-generators-to-wind-power/Conclusion

Wind power is an intermittent electricity generation power source that requires back-up power from fossil burning facilities when the wind does not blow or freezing temperatures, as was the case in Britain

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[45] http://www.wind-watch.org/documents/why-pro-wind-studies-often-use-a-10-km-radius/

last December, result in their not being able to generate power. So far, wind developers have been able to construct their wind farms without having to deal with the need for back-up power because sufficient fossil fuel generating power exists. However, it has been determined in Britain, that their goal of almost one-third renewable generation, mostly wind power, by 2020 cannot be met without an additional 17 natural gas-fired plants as back-up power.

The power companies that will need to build those plants and run them on standby want a capacity payment to pay for the cost of those units. So, taxpayers and consumers will be paying for the wind power, their subsidies, and the standby power that is needed to keep the lights on. And, some believe there is no net gain in emissions because the ramping up and down of the fossil fuel plants causes more fuel to be burned and more carbon dioxide to be emitted than running the fossil units in steady state.

How long will it take for politicians to get wise to wind power?

[i] Energy Central, Energy giants want billions for back-up to wind farms, June 29, 2011, [illegible]

[ii] Raptor Politics, Wind farms- We now have to pay twice to destroy and upland biodiversity, June 29, 2011, [illegible]

[iii] Impact of Climate Change, Throwing Money to the Winds, June 27, 2011, [illegible]

[iv] Yorkshire Post, Inefficient wind farms increase pollution from fossil fuels, June 22, 2011, [illegible]

[v] Ibid.

[vi] Cambridge news, Plans for "monstrous" wind farm thrown out, June 21, 2011, [illegible]

[vii] This is Devon, Relief for campaigners as controversial wind farm is rejected, June 23, 2011, [illegible]

[viii] The Telegraph, Wind farm forced to close because of complaints over the noise, July 6, 2011, [illegible]

Government Report Confirms that Federal Energy-Related Subsidies Have Increased 108 Percent in 3 Years; Wind Subsidies Increased 10-fold

Posted August 2, 2011

WASHINGTON – The Energy Information Administration (EIA), a research and data analysis arm of the Department of Energy, has released a report that details the amount of taxpayer subsidies that were distributed to energy producers in 2010. The federal government handed out $37.2 billion to energy producers in 2010, an increase of 108 percent from the $17.9 billion doled out in 2007. The largest increases in federal subsidies were in renewable and end-use subsidies.
Among the key findings:
-Subsidies to the wind industry increased 10-fold, from $467 million in 2007 to $4.9 billion in 2010, while that source's share of total energy production increased from 0.5 percent to 1.2 percent during the same time.

-Renewable energy subsidies increased by 186 percent from $5.1 billion to $14.7 billion.
-In 2010, solar received $775.19 per unit of energy produced and wind received $52.68. That same year, hydropower received $0.84 per unit of energy produced and coal received $0.64 per unit.
-In 2010, oil, natural gas, and coal accounted for 78 percent of U.S. energy production while receiving 11 percent of all federal energy subsidies.
In response to the report, Thomas Pyle, president of the Institute for Energy Research, issued the following statement:
"This new report shows the huge price tag for politically-favored energy sources. With the American taxpayer footing the bill, the federal government handed over $37 billion dollars to energy companies in 2010 alone. At a time when our nation is drowning in $14 trillion of debt, Washington has no business propping up companies with taxpayer dollars.
"President Obama has doubled-down on taxpayer subsidies for politically-favored energy sources. While the 'green energy future' sounds good in a speech, these sources continue to provide negligible amounts of energy and suck up billions of dollars every year from American taxpayers. It's about time for President Obama to realize that Washington-controlled energy dictates are wasting taxpayer dollars and providing no benefits to the American people.
"More than ever, America needs a level playing field for energy producers so that companies are forced to compete in the marketplace and taxpayers can hold on to more of their hard earned money."[46]

Wind industry is addicted to tax payer funded stimulus funds and grants-- that are unsustainable

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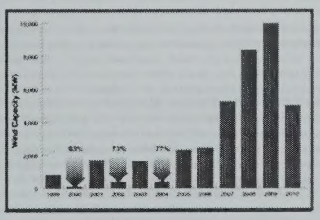

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[46] http://www.instituteforenergyresearch.org/2011/08/02/government-report-confirms-that-federal-energy-related-subsidies-have-increased-108-percent-in-3-years-wind-subsidies-increased-10-fold/

[47] source: http://www.awea.org/issues/federal_policy/upload/PTC_April-2011.pdf

Local resistance to industrial wind projects is also growing, a fact that AWEA claims is due to "NIMBYs." AWEA's use of that word is a slur on those who are trying to protect the value of their homes and property against industrial wind projects.

Here's the reality: the backlash against industrial wind is real, it's global, and it's growing. The U.S. has about 170 anti-wind groups. AWEA doesn't want you to know that a number of towns in New York state have prohibited the construction of industrial wind turbines. In April, the town of Falmouth, Massachusetts enacted a year-long moratorium on construction of new wind turbines. And earlier this month, a pair of environmental groups in Massachusetts called for a ban on new turbines in the state until more work is done on the health effects of wind turbine noise.

The wind lobby is desperate to downplay the problem of infrasound from wind turbines. But this month, in a peer-reviewed article in the *Bulletin of Science, Technology & Society*, Carl V. Phillips, a Harvard-trained PhD, concludes that there is "overwhelming evidence that wind turbines cause serious health problems in nearby residents, usually stress-disorder type diseases, at a nontrivial rate."

The subsidies for wind energy are in peril. A recent report from the Energy Information Administration shows that in 2010, the wind energy sector got more federal subsidies than any other energy sector other than biofuels. The report found that wind energy got a total of $4 986 billion in subsidies, or nearly twice as much as was given to the oil and gas sector, which got $2.82 billion. The majority of the wind energy money came from the federal stimulus package passed in 2009. But much of that stimulus money has been spent."[illegible]

Emergency response: Fires /injuries/fatalities/structure failures:

Spirit Lake, IA man dies after falling from wind turbine
Posted: Aug 22, 2011 3:35 PM PDT

A Spirit Lake Iowa man has died after falling nearly 60 feet from a wind turbine he was climbing in Osceola County.

Authorities say 33-year-old Christopher Paulette of Spirit Lake, was taken to a local hospital after the incident where he later died.

The Osceola County Sheriff's department were called to the scene at a Nextera windmill site south of 110th Street and Van Buren Avenue near Ocheyedan around 11:30 Monday morning.

The incident remains under investigation: sourcehttp://www.ktiv.com/story/15319031/spirit-lake-ia-man-dies-after-falling-from-wind-turbine

The linked April 25 KTXS article reported on an Abilene TX turbine fire spread to surrounding vegetation. Three volunteer fire departments fought the fire in rugged terrain to keep it from spreading to other turbines: http://www.ktxs.com/big_country_news/28979095/detail.html

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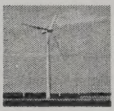
[illegible] http://www.eenews.net/assets/2011/08/01/document_gw_04.pdf

http://www.firebrand-comms.com/news/client/press/view/44/turbine-fire-protection:

17 January 2011



With governments across the globe becoming ever more aware of the environmental benefits of wind-generated power, the number of wind farms and the financial investment in constructing, erecting and maintaining wind turbines is increasing exponentially. While, according to the World Wind Energy Association's World Wind Energy Report 2009, the USA tops the league table in terms of the installed capacity of wind power, followed by China, Germany, Spain and India. Together, these five countries - again according to the WWEA - last year accounted for nearly 80 percent of the worldwide wind capacity.

With the growing global interest in wind energy, turbine manufacturers and operators are becoming acutely aware of the financial implications, safety issues and environmental impact of fire-damaged or destroyed turbines. At the same time, the USA's NFPA [National Fire Protection Association], Germany's VdS and Germanischer Lloyd are all working on standards and codes of practice.

This has led to several detection and suppression systems being promoted as appropriate solutions. However, while many are effective for "conventional" applications, they are not designed for the particular fire challenges found in wind turbines. The majority of turbine fires are started by a lightning strike, mechanical failure or electrical malfunction. They can be fuelled by up to 200 gallons of hydraulic fluid and lubricants in the nacelle, which itself is made from highly flammable glass fibre

Braking systems are a high fire risk; overheating can result in hot fragments of the disc brake material breaking off and rupturing a hose, resulting in highly combustible hydraulic fluid being expelled under pressure and coming into contact with the hot disk brake fragments. Hydraulic pumps and connections have also been known to fail, allowing the fluid to erupt into flames when it comes into contact with a hot surface.

Electrical equipment is another high risk area. Capacitors, transformers, generators, electrical controls and transmission equipment, all have the potential to catch fire, as do SCADA [Supervisory Control and Data Acquisition] systems. There is also the risk of fire due to loose or broken electrical connections or the overloading of electrical circuits.

UNIQUE FIRE PROTECTION CHALLENGE.

Wind turbines have inherent special challenges that an effective fire detection and suppression system have to overcome.

The core issue is, of course, remoteness. This is especially so with off-shore farms, but even on-shore farms are invariably in remote locations. So, around-the-clock reliability, an absence of false alarms, the ability to contend with vibration, dust, debris and airflow through the nacelle, extreme temperature variations and the ability to stop a fire precisely where it breaks out and before it takes hold are all of critical importance. So too is the need for the system not to require any external power, if the solution is to be relied upon to deliver 24/7 unsupervised protection.

Excerpts below taken from FIRE ENGINEERING website:

http://www.fireengineering.com//articles/print/volume-164/issue-4/features/response-to-emergencies-in-wind-turbines.html

EMERGENCY OPERATIONS

Standard operating procedures/guidelines (SOPs/SOGs) for emergency operations at wind turbine sites are absolutely necessary. The turbine-supporting tower can be as much as 300 feet high with very slim access shafts (generally no elevators, just vertical ladders) and extremely confined interiors. Although a few towers may be equipped with elevators, they would be very tight spaces. They could be used where available for lifting some rescue personnel and equipment up to the nacelle, although it would be difficult to lower a victim unless that person could be evacuated in a standing position.

High-angle rescue techniques are the most appropriate, but they must incorporate very specific actions.

Spain ranks fourth in the world in wind power production; several Spanish companies are recognized world leaders in the engineering, design, and construction of wind turbines. The Navarra region has the country's highest concentration of aerogenerators. Recognizing the need for emergency response procedures, the Navarra Emergency Response Agency, in close cooperation with the Spanish affiliate of General Electric, one of the country's leading aeolic energy providers, developed a very precise SOP for emergency response to incidents involving wind turbines at any height as well as the surrounding wind farm site (see sidebars "Wind Turbine Emergency Procedure" and "Wind Turbine Rescue"). The 12-station agency has more than 1,000 employees and protects a 3,861 square-mile area with 640,500

residents. The adaptation of the Navarra SOP below provides a guideline for all fire departments worldwide in developing specific SOPs/SOGs for emergency response to incidents involving wind turbines.

The Caithness Windfarm Information Forum, based in the United Kingdom, compiled a summary of more than 900 incidents involving wind turbines.[1]

In a December 2009 incident in Uelzen, Germany, a fire occurred in a wind turbine at a height of 130 meters (427 feet). The fire department closed off the the area and allowed the fire to burn out because it could not fight the fire at that height and had no other choice.

Lightning strikes damaged wind turbines on the Campo Indian Reservation in California in August 2009, severely damaging two of them.

At the same installation, in April 2010, a wind-farm worker who suffered an electrical shock was airlifted to safety.

Lightning struck a turbine that was offline for repairs at the Elkhorn Ridge wind farm near Bloomfield, Nebraska, in August 2010. There were no injuries. The Bloomfield Fire Department responded to the emergency call, but the small fire burned itself out. In late 2008, an explosion and fire in a turbine injured three workers during construction of the wind farm.

In August 2010, the Hatchet Fire burned five acres near wind turbines before crews contained it. The fire occurred west of Hatchet Ridge, California.

The most recent wind turbine emergency at this writing occurred in December 2010 at the Pouille-les-Coteaux wind farm in France. The report said that firefighters had to rescue an injured 22-year-old maintenance technician by lowering him 98 meters (322 feet) in freezing temperatures.

The interior dimensions of wind turbines vary among manufacturers, but in general they are all pretty tight. Mounted on the top of the tower, the nacelle contains the electricity-generating equipment that is connected to the turbine blades. In general, a typical nacelle is approximately 30 feet long, between 7½ and 8 feet high, and around 9½ to 11 feet wide. An "average" man—six feet tall with a trim build—would have to crouch and bend himself in pretty much all interior spaces. The largest open area is around the service hoist and around the drive shaft. Some blade manufacturers claim that their blades are accessible, but they don't describe the physical characteristics necessary to get into the blades. The blades are one of the problematic spaces for possible entrapment.

The average tower diameters are between 14 and 15 feet at ground level, about 12 feet at midheight, and between seven and 10 feet at the top where the nacelle is mounted. Tower heights can range from 150 feet up to 330 feet; some more recent generation towers are even higher.

EMERGENCY SITUATIONS

Fire and personal injury are the principal emergency situations that could affect a wind turbine and require emergency service response. These two overall categories encompass many variants that require specific response procedures. Added to the high initial costs of engineering and construction, damages to a wind turbine could well run up to hundreds of thousands of dollars in repairs and reconstruction, in addition to many months of downtime and subsequent loss of income.

Fires can occur in distinct locations and heights and may involve various fuels and ignition sources. The wind tower's primary objective is to produce electricity. Hence, a number of possible ignition sources exist from ground level and in more than a few wind farms, from underground levels up to more than 300 feet above ground.

Fuels can include electrical cables, plastics, and even textiles, any and all of which can also be found at all heights. Since the construction materials used in these towers and their components will invariably include plastics and possibly some combustible metals (e.g., titanium and aluminum, among others), as well as relatively easily deformable metallic structural and enclosure materials, the consequences of a fire in a wind turbine can be disastrous.

Also, a fire in a turbine assembly can propagate to surrounding vegetation and produce a wildland fire risk, and a fire involving surrounding vegetation could pose a threat to the wind farm.

The origins of fires in wind generators are numerous and in some instances almost inevitable. Statistics show that the major cause of fires in aerogenerators is lightning. Although aerogenerators include lightning arresters and other elements to reduce the potential of ignition from lightning strikes, they do not completely eliminate possible lightning damage.

Another frequent cause of fires is the mechanical friction among the multiple moving parts of the turbine assembly, gears, shafts, and other moving or rotating metal components that may provoke sparking. Since the average wind turbine may contain more than 200 gallons of hydraulic fluid plus variable quantities of other lubricants and similar combustible liquids, there's no shortage of fuel.

Electrical short circuits can occur in numerous locations, anywhere from the windmill's top to the base. Fires in wind turbines are known to contribute to structural failure and collapse.

The major inconvenience at wind farms in regard to possible fires is that most of these installations are unattended. The operating companies have technicians available within reasonable distances, but they are not usually present, except during periodic inspections or maintenance operations. Fire protection at wind farms and inside the aerogenerators depends entirely on automatic fire detection and extinguishment systems, with reliable and constant supervision at one or more fixed locations. Detection is usually multidisciplinary, including early detection—fast response systems coupled with self-contained automatic extinguishing systems such as water mist or inert gases. The detection systems, usually networked and requiring detection/confirmation of a fire, instantaneously communicate the alarm to the supervision station and simultaneously activate the extinguishing system. The supervision of the detection and extinguishing systems must be full-time and be able to clearly and concisely communicate complete information to responsible emergency responding agencies.

Responding fire departments may normally be several miles away and have to travel over roads that quite often require all-wheel-drive vehicles. The primary limiting factors to fire department intervention are the height of the fire and the extremely limited vertical access inside the tower. A fire actively fought, controlled, and extinguished by fire department personnel would be a rare event. The general rule established in SOPs is not to attempt to physically attack a fire inside the tower and generator assembly but instead to rely on the fixed installations. At the same time, it would be necessary to establish an exterior defensive attack to protect exposed structures and vegetation near the affected tower.

It is absolutely imperative that emergency responders interact with the wind turbine operators to create, implement, and maintain preemergency response planning. Responders should go to the site to familiarize themselves with the facilities and develop simulation emergency exercises with the operators.

Human injury rescue operations are another matter. Emergencies involving physical injury to operational and maintenance personnel occasionally present in and around the wind generators (mainly falls and similar accidents) and will inevitably require high-angle rescue techniques and tactics, since an injured operator may be more than 300 feet above ground and inside very tight confined spaces that have extremely limited access. These possible rescue situations are addressed in the detailed Navarra Emergency Agency SOPs/SOGs below.

NAVARRA EMERGENCY AGENCY WIND TURBINE EMERGENCY RESPONSE SOPs/SOGs

Hazards. Since an emergency situation involves electricity-generating systems situated at heights of from 120 to more that 300 feet above ground, including mechanical devices with multiple moving components, you must consider the following basic hazards. possible falls from great heights, the risk of electrocution, and entrapment.

Personal protective equipment (PPE) for each responder should include an approved harness, a dynamic anchoring rope, safety shackles, an adequate helmet, and gloves.

Team PPE should include the following:

- Rucksacks or bags with high-angle equipment (descenders, rope clamps, carabiners, pulleys, shackles, tape, protectors, and so on).
- Antifall devices for 8-mm steel cable, provided by the owner of the site, or dynamic rescue rope equipment for fall protection.
- Static and dynamic rope in lengths sufficient to access the height of the machinery (nacelle and blades). Alternately, sufficient lengths of rope that can be tied together, ensuring that the knots will pass through descenders and pulleys.
- A stretcher (backboard or stokes basket) that can be used horizontally or vertically. A confined-space stretcher may be necessary in very confined spaces, such as inside the nacelle or propeller blades.

Other equipment includes a flashlight and a two-way radio certified for use in confined spaces that have metallic enclosures.

Possible emergencies may include entrapment by mechanical elements in the nacelle, electrical shock, persons who have collapsed (e.g., fainted, suffered a heart attack or a similar ailment) or fallen inside the hub or tower, fire, and falls from the exterior wind turbine structure.

Overall personnel safety measures include the following:

- Before commencing operations, ensure that machinery is shut down and that no machinery will be started up during emergency operations.
- Shut off electrical power to the aerogenerator.
- Always maintain antifall equipment connections while working where falls might occur, even inside the nacelle.

During any emergency situation involving aerogenerators, a company maintenance operator must be present.

Aerogenerators have numerous anchorage points. In an evacuation by stretcher, it will be necessary to alternate between horizontal and vertical positions. The horizontal is a must for exiting the nacelle (exterior) or for crossovers inside the tower tube.

Wind turbine towers range from 120 to more than 300 feet in height, and even higher towers are in design. Hence, you must consider the possibility of evacuation from heights greater than the lengths of the rescue ropes. If ropes must be tied together to obtain the needed length, you must ensure that knots can pass through eyes.

Alarm reception. The recipient of the initial and follow-up alarm communications for emergencies involving wind turbines must obtain the following information and supplement it as the situation evolves.

- Incident type: Fall, entrapment, fire.
- Incident location: Wind farm site and number of the aerogenerator involved.
- Number of victims, their locations, and conditions.
- Access to the wind farm and the particular aerogenerator.
- Weather conditions.
- Any additional information.

For fire in an aerogenerator, do the following.

- Confirm disconnection of electrical power from other machinery or a substation.
- Establish a safety perimeter of 750 feet around the involved tower for possible falling components.
- Prevent spread of fire to surrounding vegetation or other exposures.

Endnote

1. Caithness Windfarm Information Forum. "Wind Turbine Accident Compilation." http://www.caithnesswindfarms.co.uk/fullaccidents.pdf.

GEORGE H. POTTER is a Spanish fire service instructor and a board member of the Spanish Firefighters Association (ASELF). A resident of Spain for almost 50 years, he has worked with fire protection systems, mobile fire apparatus, and training public service firefighters and officers and industrial emergency responders. Potter is a former Anne Arundel County, Maryland, volunteer firefighter and a United States Air Force crash rescue firefighter. He leads a working group in the firefighters' association dedicated to developing and coordinating fire service response procedures to emergencies in wind turbine[49]

More on Adverse health effects and industrial wind turbines

July, 2011 by Carmen M.E. Krogh and Brett S. Horner
Summary:

The siting of industrial wind turbines in Ontario has been based on predictive computer modelling. While there is ample evidence regarding adverse health effects, the conduct of human health studies to determine regulations for setbacks and noise levels that protect health is still lacking. The purpose of this document is to inform authorities and decision makers of new evidence, including articles published in peer reviewed scientific journals which advance knowledge on the topic of adverse health effects of industrial turbines. [50]

Abstract
There is overwhelming evidence that wind turbines cause serious health problems in nearby residents, usually stress-disorder type diseases, at a nontrivial rate. The bulk of the evidence takes the form of thousands of adverse event reports. There is also a small amount of systematically-gathered data. The adverse event reports provide compelling evidence of the seriousness of the problems and of causation in this case because of their volume, the ease of observing exposure and outcome incidence, and case-crossover data. Proponents of turbines have sought to deny these problems by making a collection of contradictory claims including that the evidence does not "count", the outcomes are not "real" diseases, the outcomes are the victims' own fault, and that acoustical models cannot explain why there are health problems so the problems must not exist. These claims appeared to have swayed many non-expert observers, though they are easily debunked. Moreover, though the failure of models to explain the observed problems does not deny the problems, it does mean that we do not know what, other than kilometers of distance, could sufficiently mitigate the effects. There has been no policy

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[49] http://www.fireengineering.com//articles/print/volume-164/issue-4/features/response-to-emergencies-in-wind-turbines.html

[50] http://www.windaction.org/documents/32829

analysis that justifies imposing these effects on local residents. The attempts to deny the evidence cannot be seen as honest scientific disagreement, and represent either gross incompetence or intentional bias[51].

Living with the negative effects of wind turbines, commentary from Barbara Draper, an Ohio Illinois resident impacted by Big Sky Wind installation with a reported 56 turbines covering about 13 square miles. Published August 24, 2011 in The Rock River Times[52]:

Wind farm sickness: Ballarat doctor calls for study

BY BRENDAN GULLIFER

10 Aug, 2011 06:25 PM

A BALLARAT doctor yesterday joined the wind turbine debate, comparing the alleged link between health problems associated with turbines to cigarette smoking's connection to cancer back in the 1950s.

Sleep physician Dr Wayne Spring said he had been treating patients from Waubra and Leonards Hill and he supported a senate inquiry call for a formal health study.

"Research needs to be done into the whole concept of wind farms," Dr Spring said yesterday. "It's like cigarettes in the 50s; people didn't believe they caused lung cancer and now we've got people living near turbines coming in early with all sorts of conditions. We've got to acknowledge the facts."

Modern Wind Turbines Generate Dangerously "Dirty" Electricity

By Catherine Kleiber
Waveforms and picture courtesy of David Colling

Wind turbines are causing serious health problems. These health problems are often associated, by the people having them, with the flicker and the noise from the wind turbines. This often leads to reports being discounted.

Residents of the area around the Ripley Wind Farm in Ontario where Enercon E82 wind turbines are installed feel that the turbines are making them ill. Residents suffer from ringing in the ears, headaches, sleeplessness, dangerously elevated blood pressure (requiring medication), heart palpitations, itching in the ears, eye watering, earaches, and pressure on the chest causing them to fight to breathe. The symptoms disappear when the residents leave the area. Four residents were forced to move out of their homes, the symptoms were so bad. Residents also complain of poor radio, TV and satellite dish reception. There is no radio reception under or near the power lines from the wind turbines because

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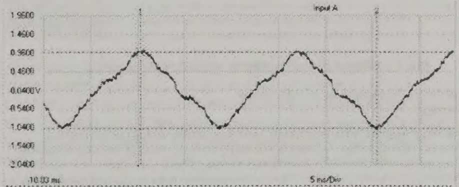
[51] http://www.windturbinesyndrome.com/news/wp-content/uploads/2011/07/Phillips-1.pdf

[52] [illegible]

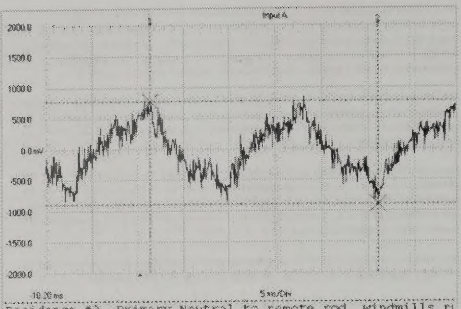
[53] [illegible]

there is too much interference. Local farmers have found that they get headaches driving along near those power lines.

The waveforms below were taken at one of the residences in the area. The first waveform was taken before the wind farm started operation. (As you can see, a ground current problem existed even before the wind farm started.) The frequency profile of the neutral to earth voltage changed dramatically after the wind farm became operational (second waveform). There are far more high and very high frequencies present; indicated by the increased spikiness of the waveform.



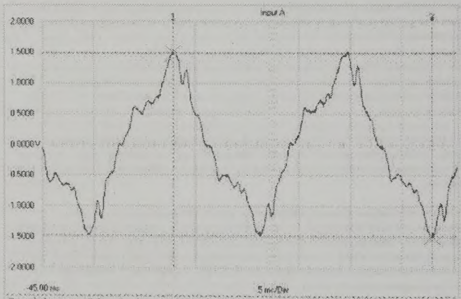
Residence #3, Primary Neutral to remote grou
were installed and running.



Residence #3, Primary Neutral to remote rod, windmills r
before the collection line was buried.

As demonstrated by these waveforms, wind turbines are extremely electrically polluting. Studies and anecdotal reports associate electrical pollution with a similar set of symptoms to those experienced by the residents of the area (1, 2, 3). The symptoms associated with electrical pollution are caused by overexposure to high frequencies and are known as radio wave sickness (4). Technical papers discuss the fact that it requires only very small amounts of high frequency signals (either from transients or communications) on wiring to induce significant electrical currents in the human body. They support findings of human health problems caused by exposure to even small amounts of high frequencies (5, 6). The specific symptoms experienced depend on both the frequencies present and the body type and height of the person being exposed. Increased risk of cancer is associated with exposure to both "dirty" power on wires and electrical ground currents (7, 8). Animals also experience health problems related to electrical pollution exposures. Dairy cow's milk production and health suffers as exposure to high frequency transients increases (9, 10).

Suncor and Acciona have tried to some degree to correct the problem at the Ripley Wind Farm. They buried the collector line from the turbine near some of the most badly affected homes and gave the homes a separate distribution line. They also put an insulator between the neutral line and the grounding grid for the wind farm. As you can see, from the waveform below, it helped somewhat. It reduced the high frequencies being induced on the distribution system by the proximity of the collectors and the high frequencies put directly on the neutral by the tie to the wind farm grounding grid. However, it is still not as good as before the wind farm installation and neither is their health.



Residence #3, Primary Neutral to remote rod, windmills or
line now buried.

This is not the only wind farm that seems to be causing serious health problems for local residents. The Enercon E82 does not seem to be unique in its design or problems. Wind turbines generate a sine wave of variable frequency in order to be able to take advantage of the full range of wind speeds. However, the grid only operates at 60Hz, so the variable frequency is converted to DC and then an inverter is used to convert the DC signal to 60 Hz AC. This is the signal that is put on the power line. Most inverters generate an extremely "dirty" signal, which is a 60Hz waveform polluted with a lot of high frequency transients. The previous waveforms are examples of this. The people in this house were so sick at home with the wind turbines running that they had to abandon their home and move elsewhere while they waited for the problem to be fixed. The changes made by the wind farm combined with a neutral isolation device installed by the homeowners has made the home livable, but their health is still affected by the operation of the wind turbines.

In order to eliminate the electrical pollution problem wreaking havoc on the health of people living in proximity to wind farms, the inverters need to be properly filtered at each wind turbine and all collection lines from the wind turbines to the substation should be buried. At the substation the electricity must also be filtered before being allowed on the power grid. There also needs to be a proper neutral system installed to handle the high frequency return current.

More information about electrical pollution and health can be found at www.electricalpollution.com. The author can be contacted with questions about electrical pollution at webmaster@electricalpollution.com. If you would like to get periodic email updates relevant to electrical pollution, please email with "join email list" in the subject heading. If you need measurements done, please contact Dave Stetzer in Wisconsin (608-989-2571 or dave@stetzerelectric.com) or Dave

Colling in Canada (519-395-5194 or kave@hurontel.on.ca).

References: 1. Havas M, Olstad A. 2008. Power quality affects teacher wellbeing and student behavior in three Minnesota Schools, Science of the Total Environment, July.

2. Havas M. 2006. Electromagnetic hypersensitivity: biological effects of dirty electricity with emphasis on diabetes and multiple sclerosis. Electromagnetic Biology Medicine 25(4):259-68.

3. Havas M. 2008. Dirty Electricity Elevates Blood Sugar Among Electrically Sensitive Diabetics and May Explain Brittle Diabetes. Electromagnetic Biology and Medicine, 27:135-146.

4. Milham S, Morgan L. 2008 A New Electromagnetic Exposure Metric: High Frequency Voltage Transients Associated With Increased Cancer Incidence in Teachers in a California School. American Journal of Industrial Medicine.

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6. Marha K, Musil J, and Tuha H. Electromagnetic Fields and the Life Environment. Institute of Industrial Hygience and Occupational Diseases, Prague. San Francisco Press 1971. SBN 911302-13-7

7. Ozen, S. 2007. Low-frequency Transient Electric and Magnetic Fields Coupling to Child Body, Radiation Protection Dosimetry (2007), pp. 1-6.

8. Vignati, M. and L. Giuliani, 1997. Radiofrequency exposure near high-voltage lines. Environ Health Perspect 105(Suppl 6):1569-1573 (1997)

9. Hillman D. Relationship of Electric Power Quality to Milk Production of Dairy Herds, 2003 American society of Agricultural Engineers Annual International Meeting, 27- 30 July 2003, Las Vegas, Nevada, USA, Paper Number: 033116

10. Rogers D.M. 2006. BC Hydro Deals with Farm Neutral to Earth Voltage. September.

The only known cure for Radio Wave Sickness is to stop being exposed to high frequencies.

[54]

Current and Historic Earthquakes
are not fully accounted for regarding turbine safety:

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[54] [illegible]

Historic Earthquakes

Imperial Valley, California

1892 02 24 07:20 UTC (local 02/23)

Magnitude 7.8

At the old Carrizo station in San Diego County, all adobe buildings were destroyed. In Paradise Valley, a church and schoolhouse built on stilts were knocked down and demolished: chimneys and plaster were broken in San Diego. Ground fissures were reported at McCain Valley and Jewel Valley; rockslides were observed between Campo and Carrizo and at Dulzura and Jewel Valley.

About 155 tremors were felt at Campo during the 12 hours following the main shock, and aftershocks continued there every few days into April 1892. Observers reported that 135 aftershocks were felt as far away as National City, on San Diego Bay. Felt north along the coast to Santa Barbara, east to Yuma, Arizona, and south to San Quintin, Baja California. One report stated that the tremor was felt at Visalia, Tulare County, about 700 kilometers north of San Quintin.

Abridged from Seismicity of the United States, 1568-1989 (Revised), by Carl W. Stover and Jerry L. Coffman, U.S. Geological Survey Professional Paper 1527, United States Government Printing Office, Washington: 1993.

Department of the Interior | U.S. Geological Survey[55]

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[55] http://earthquake.usgs.gov/earthquakes/states/events/1892_02_24.php

Dead Red Kite

A red kite killed by wind turbines in Italy : photo dated August 15, 2010[56]

Effects of wind farms on wintering Sandhill Cranes in the Southern High Plains of Texas
Laura Navarrete, Kerry Griffis-Kyle, David Haukos
Texas Tech University, Lubbock, Texas, United States

Texas has been shown to have a superior annual capacity for wind power and this capacity has led to the erection of multiple wind farms across Texas with many more facilities planned. Wind energy is vital for a shift to carbon-emission free energy, however there has been relatively little research investigating the effect of wind farms as disturbance factors across the landscape. This project examines how wind energy infrastructure affects Sandhill Crane behavior including landscape level habitat uses. Sandhill cranes are known to avoid human disturbance and wind farms have been shown to render surrounding habitat of up to 1 km unsuitable through direct effects (destroying habitat) and indirect effects on bird behavior (avoidance). We examined the distribution of cranes at multiple wind farms in the Southern High Plains of Texas. We evaluated the effects wind farms have on roost occupancy, habitat use and crane behavior by comparing areas with wind turbines to those without for presence of cranes at roosting sites and behavior of cranes at foraging sites. Preliminary findings showed that cranes were found less likely to forage within 2 kilometers of the wind farms and exhibited a clumped distribution when found near wind farms. Additionally, cranes foraging within two kilometers of the wind farms spent more of their time being vigilant and less time loafing than the cranes outside the two kilometers. These findings, along with further analysis can be used to predict areas of avoidance and help preserve important crane habitat in a rapidly developing landscape.

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[56] http://www.wind-watch.org/pix/displayimage.php?album=1&pos=15

Golden Eagles At Risk/ BLM determined that "take" is possible according to scoping comment letter that referenced USFW memo neither of which were posted on project website:

O13-25

__Excerpt from that Jan 2011 letter:__
__Golden Eagle.__ We are very concerned about the near certainty that the proposed project will result in significant impact to Golden Eagles in the form of "take" which would likely involve mortality due to collisions with rotating turbine blades and wires, and disruption of essential behaviors involving loss of foraging habitat, potentially leading to loss of productivity and nesting success. We are aware, based on a recent memorandum from BLM to the U.S. Fish and Wildlife Service (FWS), that BLM has made an initial determination that the Ocotillo Express Wind Energy Project would impact Golden Eagle breeding activity and that "take" was likely. Furthermore, BLM concluded that these impacts could not be sufficiently mitigated to achieve the "no net loss" standard established for this species by FWS. The FWS concurred with BLM's determination in a response memorandum.[57]:

Feds probe death of golden eagles

Credit: UPI, www.upi.com 3 August 2011

The U.S. Fish and Wildlife Service said federal authorities are investigating the deaths of at least six golden eagles at a California wind project.

The facility under scrutiny was identified as the Pine Tree Wind Project in the Tehachapi Mountains operated by the Los Angeles Department of Water and Power, the Los Angeles Times reported Wednesday.

Wildlife spokeswoman Lois Grunwald declined further comment on what she described as "an ongoing law enforcement investigation regarding Pine Tree."

To date federal wildlife authorities have not prosecuted a wind-energy company in connection with the death of birds protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, the Times said.

Shawn Smallwood, an expert on raptor ecology, predicted the investigation would "ruffle wind industry feathers across the country."

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[57] http://wilderness.org/files/Ocotillo-Express-Scoping-Comments.pdf

"Wind farms have been killing birds for decades and law enforcement has done nothing about it," Smallwood said.[58]

NBC News 8-20-11: Wind Turbines Kill American Eagles:

Separate story:

As California attempts to divorce itself from fossil-fueled electricity, it may be trading one environmental sin for another – although you don't hear state officials admitting it.

Wind power is the fastest growing component in the state's green energy portfolio, but wildlife advocates say the marriage has an unintended consequence. dead birds, including protected species of eagles, hawks and owls.

"Politics plays a huge role here," Smallwood said. "Our leaders want this power source so they're giving, for a time being, a pass to the wind industry. If you or I killed an eagle, we're looking at major consequences."

Smallwood and others say it is almost inconceivable the U.S. Fish and Wildlife Service, which enforces the U.S. Endangered Species Act, the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act, hasn't acted.

"There's a big, big hypocrisy here," Sue Hammer of Tehachapi Wildlife Rehab in Kern County said. "If I shoot an eagle, it's a $10,000 fine and/or a vacation of one to five years in a federal pen of my

In 2009, Exxon pleaded guilty to causing the deaths of about 85 migratory birds in five states that came into contact with crude oil in uncovered waste tanks. The fine for this was $600,000.

Likewise, PacifiCorp, an Oregon utility, owed $10.5 million in fines, restitution and improvements to their equipment after 232 eagles were killed by running into power lines in Wyoming.

And in 2005, the owner of a fish hatchery was ordered to serve six months in a federal halfway house and pay a $65,000 fine for shooting an eagle that was feeding at his uncovered hatchery.

Wind power in the U.S. generates 41,400 megawatts of electricity. California represents just a fraction of that total, suggesting the number of raptor kills is considerably higher nationwide. Yet according to records, USFWS has not prosecuted a single company for violating one of the many statutes protecting threatened and endangered birds.[59]

Read more: http://www.foxnews.com/scitech/2011/08/16/energy-in-america-dead-birds-unintended-consequence-wind-power-development/#ixzz1Vc0CO1VD

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[58] http://www.wind-watch.org/news/2011/08/03/feds-probe-death-of-golden-eagles/

[59] http://www.windaction.org/videos/32818

Area of impact overlaps for Ocotillo Wind, Tule Wind, ESJ, Shuluuk Wind, Manzanita Wind, CNF Wind competition sites in Fred Canyon and Kitchen Creek Area,

Sacrifice of protected birds unintended consequence of wind power development

***Credit:* www.foxnews.com 17 August 2011**

As California attempts to divorce itself from fossil-fueled electricity, it may be trading one environmental sin for another — although you don't hear state officials admitting it.

Wind power is the fastest growing component in the state's green energy portfolio, but wildlife advocates say the marriage has an unintended consequence: dead birds, including protected species of eagles, hawks and owls.

"The cumulative impacts are huge," said Shawn Smallwood, one of the few recognized experts studying the impact of wind farms on migratory birds. "It is not inconceivable to me that we could reduce golden eagle populations by a great deal, if not wipe them out."

California supports roughly 2,500 golden eagles. The state's largest wind farms kill, on average, more than 80 eagles per year. But the state is set to triple wind capacity in the coming years as it tries to become the first state in the nation to generate 33 percent of its electricity from clean energy sources by 2020.

"We would like to have no bird deaths and no bird injuries. But, once again, we have to balance all the needs of society. All the people who want to flip their switch and have electricity in their homes," said Lorelei Oviatt, Kern County planning commissioner.

Kern County has identified some 225,000 acres just north of Los Angeles as a prime wind resource area. Unfortunately, the area's rolling hills and mountains are prime hunting grounds for raptors and a layover spot for migratory birds traveling between Canada and Mexico. The updrafts enjoyed by birds of prey are ideal for generating power.

"I'm not against wind power — it is a viable form of energy generation — but it needs to be developed more carefully," Smallwood said.

Case in point: In the Bay Area, when activists in the 1980s demanded a cleaner planet, the state responded with the Altamont Pass Wind Resource Area. The state-approved wind farm, built with federal tax credits, kills 4,700 birds annually, including 1,300 raptors, among them 70 golden eagles, according to biological reports generated on behalf of the owners.

Smallwood said replacing the small, older turbines with larger blades has cut some species fatalities roughly in half.

Oviatt said Kern County is trying to learn from Altamont's mistakes.

"We're requiring full environmental impact reports, which take at least 12 to 18 months," Oviatt said. "Can I promise that a bird will never be injured or killed? I can't. But again, we have this tradeoff in society, between the things we need to function as an economy and the fact that we wanna make sure we have an environment for future generations."

Pine Tree is one of the wind farms in Kern County and is operated by the Los Angeles Department of Water and Power. According to an internal DWP bird and bat mortality report for the year ending June 2010, bird fatality rates were "relatively high" at Pine Tree compared to 45 other wind facilities nationwide. The facility's annual death rate per turbine is three times higher for golden eagles than at Altamont.

"Politics plays a huge role here," Smallwood said. "Our leaders want this power source so they're giving, for a time being, a pass to the wind industry. If you or I killed an eagle, we're looking at major consequences."

Smallwood and others say it is almost inconceivable the U.S. Fish and Wildlife Service, which enforces the U.S. Endangered Species Act, the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act, hasn't acted.

"There's a big, big hypocrisy here," Sue Hammer of Tehachapi Wildlife Rehab in Kern County said. "If I shoot an eagle, it's a $10,000 fine and/or a vacation of one to five years in a federal pen of my choice."

She's not far off from the reality.

In 2009, Exxon pleaded guilty to causing the deaths of about 85 migratory birds in five states that came into contact with crude oil in uncovered waste tanks. The fine for this was $600,000.

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Wind is expensive & unreliable:

NREL working on gearbox validation and testing to improve overall reliability The gearbox has been something of an Achilles Heel for wind with several manufacturers having to spend millions changing out

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[60] http://www.wind-watch.org/news/2011/08/17/energy-in-america-sacrifice-of-protected-birds-unintended-consequence-of-wind-power-development/

faulty gearboxes. While it is a couple of years now since that last flap of this kind, owner confidence in the gearboxes supposed 20-year lifespan is not high[61].

Cost and Quantity of Greenhouse Gas Emissions Avoided by Wind Generation

[Alternate short URL for linking/sharing • HOME]

Author: Lang, Peter

Wind power is intermittent, so either energy storage or constantly, instantly available back-up generation is required to provide constant power.

This paper contains a simple analysis of the amount of greenhouse gas emissions avoided by wind power and the cost per tonne of emissions avoided. It puts these figures in context by comparing them with some other ways of reducing greenhouse gas emissions from electricity generation.

The conclusion: wind farms connected to the National Grid provide low value energy at high cost, and avoid little greenhouse gas emissions:

1. Wind power does not avoid significant amounts of greenhouse gas emissions.

2. Wind power is a very high cost way to avoid greenhouse gas emissions.

3. Wind power, even with high capacity penetration, can not make a significant contribution to reducing greenhouse gas emissions[62]

WIND POWER
IMPORTANT QUESTIONS AND ANSWERS
A commentary for politicians and senior bureaucrats

Here are the **simple questions** along with **simple answers** about wind power that need to be asked and answered **on behalf of taxpayers and power consumers**. The questions and answers are applicable Australia wide, but figures presented apply, in some cases, to Victoria specifically. The simple conclusion is reached that **generation of power**

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[61] http://www.windstats.com/

[62] http://www.wind-watch.org/documents/cost-and-quantity-of-greenhouse-gas-emissions-avoided-by-wind-generation/

from wind saves virtually no greenhouse gas and is a monumental and total waste of money. Detailed proof of may be found in many technical articles on the net and one particular reference is quoted for those who wish to do a little research for themselves.

Does wind power:

1. *measurably reduce greenhouse gas ("GHG") emissions from power generation* – **no, detailed analysis shows net savings are miniscule, no more than about 5% of that claimed by promoters (and supported by government);**
2. *allow the decommissioning of a single fossil fuelled power generator* – **no, not at anytime;**
3. *allow us to meet the 20% target for renewable energy contribution* – **we can meet that target just by building enough turbines, about 5600 in Victoria at a cost of about $17 billion, but would also have to build additional matching gas turbine infrastructure costing some $3 billion and we would not reduce emissions measurably;**
4. *increase energy costs* – **yes, very significantly;**

***Who pays** for the increase in costs?* – **the power consuming public.**

How can this be?

The ***unfortunate but nature driven flaw*** in the generation of power from wind is that **wind speed is highly variable over short periods of time;** and further, if the wind speed changes, the energy produced by the wind turbine changes by the cube of the change in wind speed; eg., if wind speed halves or doubles, the energy produced decreases or increases by eight times.

Compounding this, ***power grids cannot store power;*** there is no economically practical way to store large amounts of power. Thus grid managers must control the power ***input*** to the grid, otherwise there will be power failures. The introduction of large amounts of highly variable and unpredictable wind power provides a significant challenge to safe and reliable management of power grids.

How were Australian power grids managed without wind power?

Power producers can be categorized as providers of **base**, **intermediate** or **peak** load power.

Base load is the predictable, steady, long term load and is usually the cheapest form of bulk power that needs to be provided by the lowest cost source. **Coal** fired generators are traditionally used for this purpose, (with nuclear also being used for this purpose in some less enlightened nations). However coal has two drawbacks, it is the most polluting power source and is unable to respond in an efficient way to changes in demand.

Gas fired generators are used to provide **intermediate or "shoulder" load** (the load between base and peak load). There are two types, **open** and **closed cycle** gas generators ("OCGG" and "CCGG" respectively). OCGG's are easier to ramp up or down, but produce higher cost power and more GHG's than the CCGG's.

Accordingly CCGG's are preferentially used to meet shoulder power demand and OCGG's for peak demand, which is generally short term in nature. Gas generators produce between one third and one half the GHGs of coal generators.

Hydropower is only available in limited quantities, but has a high value as it can respond very quickly to changed requirements and is the ultimate method for balancing the grid. It produces no GHG's.

How are grids to be managed with the introduction of a significant amount of wind power?

Now that we are set to introduce large amounts of wind power to the grid (in Victoria planning approvals have been granted for another **1550 MW** of wind, (equal to **18%** of the current capacity of all types of generation) the grid must have available OCGG capacity equal to the maximum output of the producing wind farms to balance, or "shadow" the wind power production. Otherwise the chronic variability of power from the wind turbines is simply unmanageable in the grid.

This OCGG capacity represents a heretofore unrecognised or unadmitted **additional cost to wind farms;** and in performing its shadowing role is a consequential additional generator of GHG's. It is this consequential GHG production **which has to be netted off against the gross GHG savings of wind** with an unfortunate result that **net savings in GHG are negligible - see table below.**

Whilst managing a grid is a moment to moment business and very complex; to estimate what is going on it is necessary to reduce the complexities to some basics. Accordingly, if we wish to calculate what happens when wind enters the grid **in significant quantities** we must add in the result of the necessary coupling of the wind facility with an OCGG; and as a result, a CCGG may and will be shut down.

Now this has a number of effects which can be summarised as follows:

	CCGG alone	**Wind/OCGG Couple**	**Change**
Power costs	$54/MWh1	$121/MWh	$67/MWh (additional cost)
GHG's produced	0.577 tonnes/MWh	0.519 tonnes/MWh	0.058 tonnes/MWh (miniscule saving)
Capital Cost of 1,000 MW	$1.0 billion	$3.8 billion	$2.8 billion (an incredible waste)

1 MWh – is the measure of power (produced or consumed) in megawatt hours

So to build (and match with a OCGG) a wind capacity of 1000 MW capacity, total costs approximate $3.8 billion; whilst to build the same amount of capacity with a CCGG would be about $ 1.0 billion, ***a saving of approximately $2.8 billion.***

For the wind/OCGG "couple" the ***public is paying $67/MWH or 224% more for this portion of their electricity.*** For the already approved 1,550 additional MW to be produced by wind, that amounts to $900 million extra each year. For the 20 year life of the wind/OCGG couple, the Victorian public will pay about ***$18 billion*** extra for their power.

For what?

Aren't we saving greenhouse gas emissions? Yes, but only about ***0.06 tonnes of CO2 equivalent per MWh.*** Both the Victorian Government and the wind farm industry claim savings of about ***1.0 tonnes of CO2 equivalent per MWh*** or *17* times this amount! They do this by ignoring the need to balance the variability of wind and therefore presenting a ***gross*** not a ***net*** figure. ***The net figure of GHG savings is so small that the only conclusion is that wind farms make no effective contribution to reducing GHG emissions from power generation.***

Would it make sense then just to build CCGG capacity and replace coal generation if that industry cannot deliver major improvements in pollutive emissions? Yes, and there is enough gas to do so. For every KWh of brown coal capacity so (permanently) replaced, GHG savings would be approximately 0.8 tonnes CO2 equivalent.

Data sources

The author has read many quite complicated articles (mostly from countries with a longer history and much greater penetration of wind turbines) on wind power and its innate problems. This material requires a degree in (preferably electrical) engineering to follow. Reducing that material to a summary for non technical readers is daunting.

The problem has to a large extent been solved by an Australian engineer, Peter Lang, who has a lifetime of experience in the power industry. He has written a paper **"Cost and Quantity of Greenhouse Gas Emissions Avoided by Wind Generation"** dated 16/2/2009 with references to some 17 other papers that have been used in his work.

The author has worked independently to produce figures on the same topic and has arrived at figures which support Lang's work, but has used Lang's numbers in this commentary.

P. R. Mitchell, Chairman
Science and Economics Committee
Australian Landscape Guardians Association Inc.[63]

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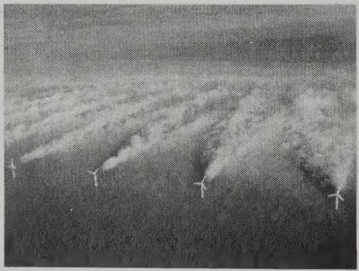
[63] http://www.epaw.org/documents.php?lang=de&article=backup1



Wake effect at Horns Rev wind energy facility, Denmark

At wind farms where many towers are clustered together, turbulence generated by the massive blades can degrade the performance of other windmills by as much as 10-20 percent. The same turbulence can also trigger vibrations in turbines downwind, leading to component fatigue, excess maintenance costs, and premature part failure. The turbines' wake effect is clearly seen at the Horns Rev offshore wind farm in the North Sea west of Denmark.[64]

China's Wind Power Sector Struggles with Rare Earth Price Hikes

By Liu Yuanyuan, Contributor
August 17, 2011

BEIJING -- While an increasing number of wind power equipment manufacturers in China have started to adopt direct-drive permanent magnet technology, rare earth minerals, some of the core raw materials used to produce wind turbines, are becoming a significant barrier to their development.

The recent price surges have forced many industry players to halt production or create a complete industry chain by expanding into the upstream sector. The price hikes are expected to intensify the already fierce competition in the sector, causing those who lack capital and expertise to be squeezed out altogether, according to an industry insider.

Rare Earth Price Skyrockets

China's rare earth prices have risen significantly since July 2010, exceeding 200 percent since the beginning of this year, with some categories reaching 600 to 1,000 percent.

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[64] source of photo and description: http://wind-watch.org/pix/556

One of the key reasons for the price explosion is the Chinese government's introduction of a levy on rare earth resources as of April 1 of this year, said Zhou Jianxiong, Chairman of Hunan province-based Xiangtan Electric Manufacturing. In addition, on May 19th the State Council of China released a document outlining the council's viewpoint on the sustainability and development of the rare earth sector in a move to regulate the market.

According to a report from Guolian Securities, the price of rare earth is expected to continue the upward trend in the second half of this year.

A Bubble Emerges

Following five successive years of impressive growth, China's wind power sector saw its growth rate decline to 37 percent in 2010. With nearly 100 wind turbine manufacturers in China, total production capacity for 2011 is expected to reach 29 GW, far exceeding the actual demand of 15 to 18 GW. This trend is evidence that the rapid development of the wind power market has led to excessive competition and accelerated formation of a bubble.

Manufacturers Address the Challenge

In response to the soaring raw material costs, Xiangtan Electric Manufacturing plans to adopt advanced processes to reduce its reliance on NdFeB (neodymium magnet), said Zhou Jianxiong.

"We are currently evaluating the impact of the rare earth price increases on our company. The Chinese government has become aware of the huge pressure facing the high-tech sector, and is promising to take action to stabilize the market price. Meanwhile, our R&D team is committed to reducing process costs while improving the performance of our products," said Yao Yu, director of public relations at Xinjiang Goldwind Science & Technology.

Furthermore, gaining direct access to upstream resources is also proving to be a solution to tackle rising costs.

Privately-held Mingyang Wind Power, for example, recently signed a framework agreement with the government of Ganzhou, Jiangxi province, one of China's major rare earth producers. According to the agreement, Ganzhou's municipal government will first provide Mingyang with rare earth resources and grant exclusive rights to develop wind farms in the city.[65]

Alternatives to destructive projects like Ocotillo Wind

Navy Region Southwest Saves Energy, Money with Solar Project

Story Number: NNS090430-10

4/30/2009

From Naval Facilities Engineering Service Center Public Affairs

CORONADO, Calif. (NNS) -- Navy Region Southwest (NRSW) is taking advantage of their greatest natural resource — sunshine. In an effort to fully utilize this abundant resource and to confront accelerating

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[65] http://www.renewableenergyworld.com/rea/news/article/2011/08/chinas-wind-power-sector-struggles-with-rare-earth-price-hikes

electricity rates, they've installed solar panels on six carports and a helicopter simulation building. These photovoltaic systems will collectively produce 700,000 kilowatt hours (kWh) of electricity.

On the helicopter simulation building at Naval Base Coronado, workers installed a Building Integrated Photovoltaic (BIPV) system — the Navy's first. This system is unusual in that its photovoltaic (PV) components do not sit on raised glass panels. Instead, these thin-film panels are integrated into the roof itself.

"The photovoltaics come in big rolls, like rolls of carpet," said Bernard Lindsey, utilities and energy program manager at NRSW. They are heat-welded onto the roofing membrane, where they are part of the watertight roof structure.

"It's just another kind of roof, except that it makes electricity," Lindsey said.

Connecting the system to the building's voltage completes the line from the sun to the roof to the light switches. The BIPV occupies approximately 14,000 square feet of this 50,000 square foot roof.

"It's more efficient to do it this way," said Lindsey. Workers can incorporate photovoltaics as they replace the roof, completing the project in one fell swoop.

With a traditional PV system, the roof would be finished first, and contractors would attach the glass panels and supporting framework later. Non-integrated systems also incur extra work when the roof needs replacing before the panels do. The BIPV is part of the overall roof system warranty.

The roof's efficiency extends to energy use. Building 352, where the new system resides, consumes three million kWh of energy annually. The new system will produce about nine percent of the building's peak summer electrical demand.

NRSW considers its new BIPV system a success.

"It works well; the building occupants are happy and it's making electricity," said Lindsey. "We should do more of them."

Innovative new roofs are not the only items soaking up rays in NRSW. In 2007, the region introduced six new solar carports.

Three naval bases, Coronado, Point Loma and San Diego, added a total of five carports, each generating approximately 80,000 kWh of energy per year. Each of these carports will offset the annual energy consumption of 14 homes.

Naval Air Weapons Station China Lake recently built a solar carport as well, to gain renewable energy and offer shade to cars of base personnel. Located in the parking lots of the Combined Bachelor's Housing and the Paradise Community Center, the new carport is estimated to save approximately 230,000 kWh of energy and $56,000 per year. It was part of a $1.4 million project funded by the Department of the Navy Energy Program through the Energy Conservation Investment Program.[66]

Macy's Goes Solar in 30 Stores with SunPower[67]

POWER PURCHASE AGREEMENT ENABLES MORE SOLAR POWER

For 17 of the 30 stores, Macy's is purchasing solar-generated electricity under a SunPower solar power purchase agreement, a solar services agreement that allows the retailer to purchase just the electricity

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[66] http://www.navy.mil/search/print.asp?story_id=44880&VIRIN=&imagetype=0&page=1

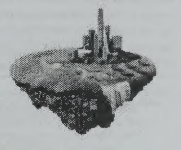
[67] http://us.sunpower.com/commercial/success-stories/[illegible]

generated at its stores—not the solar power systems themselves—from a third-party financier. With no capital investment, at the end of a 10-year term, Macy's will have the option to renew the agreement, transfer the equipment to a new site, or buy the system. Macy's will buy solar power systems for the remaining 13 stores through an outright system purchase.

Macy's installation of SunPower PowerGuard and SunPower T10 Solar Roof Tile atop 30 stores—in addition to significant energy efficiency upgrades—makes it the largest solar and energy efficiency initiative of any national retailer

A guide to assist designers and operators of power systems that will connect and disconnect from the grid has been approved

by the IEEE Standards Board.



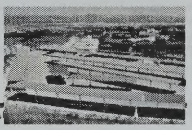
IEEE 1547.4 provides alternative approaches and best practices for designing, operating, and integrating distributed resource (DR) island systems with electric power systems. (At SGN we refer to these island systems as microgrids.) Bottom line, these DR island systems – or microgrids – all share the ability to generate their own electric power as well as the ability to connect and disconnect from a power grid that serves a wider geographic area.

The military has been a leader in microgrid development, but as Judith Gorman, managing director of the IEEE Standards Association notes: "The first paradigm shift in electricity generation, delivery, and control is rapidly emerging, particularly in Europe, North America, and Japan. The shift is moving the electricity supply away from the highly centralized service model seen today towards a more dispersed system, and distributed island resources will play a key role." She expects the IEEE 1547.4 guide will be very relevant to the global energy industry as this shift continues to gain momentum.

US Military Solar Project Completed

June 23rd, 2011 by Foxy

A solar project has been completed at Marine Corps Base in Camp Pendleton (San Diego) that consists of a 936 kW solar electric car port. The system was designed by Independent Energy Solutions (IES) and the system is located at Pendleton's new Bachelor Enlisted Quarters. The solar project is estimated to produce nearly 1.3 million kilowatt hours per year and will also serve as a shade structure and cover for parked cars.



The finished project consists of 15 custom steel shade canopies, 4,352 Kyocera solar modules, 4 Satcon inverters and a customized racking system. It produces the equivalent power to 120 average single-family homes and will offset about 860 tons of greenhouse gases annually. The CO2 reduction is similar to removing 215 cars from the road.[68]

GREEN TECHNOLOGY FEATURED ARTICLES

August 23, 2011

ClearEdge Raises $73.5M for Expansion and Commercialization of CHP Fuel Cell

The financing, which ranks among the largest clean-tech investments of the year, to date, will be used to advance customer adoption in key commercial markets, expand internationally, and develop and commercialize new products. New investor, Artis Capital Management of San Francisco led this round, which also included Guaranty Renewable Energy of Austin , Southern California Gas Company, a regulated subsidiary of Sempra Energy of San Diego, and existing investor Kohlberg Ventures of Portola Valley, California.

"As a leading producer of distributed generation solutions for light commercial applications, ClearEdge Power is changing the way businesses across the world get their energy," said ClearEdge Power President and CEO Russell Ford. "This new investment provides the capital necessary for ClearEdge Power to build on our already strong foundation by entering new markets, advancing our technology, and commercializing new products."

ClearEdge manufactures fuel cells that run on natural gas, which is then broken down into a hydrogen-rich gas. The natural gas mixes with oxygen in the fuel cell—inducing a chemical reaction that generates both electricity and heat within the cell. Therefore, the fuel cells can be used in commercial power and heating applications — such as keeping a hotel hot during the winter or heating water, instead of requiring a separate water heating source.

The fuel cells plug into a typical power grid, but there are plans to make them independent of a power grid, the company said. Each is about the size of a refrigerator, costs around $56,000, and generates 5 kilowatts (kW) of power and 5.8 kilowatts of energy in the form of heat — so it's a little impractical for typical residential owners.

"We're still interested in high-end residential cells — a 5,000 square foot house or larger," Mike Upp, vice president of Marketing for the company, told VentureBeat. "Those are our early customers, but the main focus is light commercial or institutional customers, like schools or businesses."

According to a recent report by Pike Research, in the last two years, the stationary fuel cell industry has seen a 27 percent compound annual growth rate. Among the reasons: Technology costs are continuing to fall, new companies are coming into the space, and adoption is gathering steam in markets such as uninterruptible power supplies (UPS), combined heat and power (CHP), and residential power.

Scalable solutions such as ClearEdge are primed for significant growth, according to the white paper, Stationary Fuel Cells. In fact, the clean technology market intelligence firm estimates that sales for the sector will surpass 1.2 million units annually by 2017.

"The fuel cell industry is reaching an important tipping point and, over the next 18 months, a clear gap will begin to emerge between companies that have strong products and clearly defined markets, and those that do not," said Dr. Kerry-Ann Adamson, Research director, Pike Research (News - Alert). "In the recent Pike report, ClearEdge Power scored very highly. The company's score was due to ClearEdge Powers' combination of market strategy and ability to execute to meet demand. ClearEdge Power also clearly differentiates its product offering (hitting a real power demand sweet spot), enabling it to reach many verticals with one product."

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[68] http://www.biofuelwar.com/2011/06/us-military-solar-project-completed/

ClearEdge recently secured a $2.8 million grant from the U.S. Department of Energy that gave the company capital to install 10 fuel cells at businesses in Oregon. The funding came from the U.S. Department of Energy's Pacific Northwest National Laboratory (PNNL), which will monitor the fuel cells to see if they are producing the kind of energy savings expected for the businesses that purchase them.

"Combined heat and power fuel cell systems can help smaller commercial buildings with high-energy demands reap significant savings in energy cost and use," said Mike Rinker, the Research Program manager at PNNL. "We anticipate that this type of a system could reduce the fuel costs and carbon footprint of a commercial building by approximately 40 percent, compared with conventional electricity and heat.

Want to learn more about the latest in communications and technology? Then be sure to attend ITEXPO West 2011, taking place Sept. 13-15, 2011, in Austin, Texas. ITEXPO (Tweet - Post) offers an educational program to help corporate decision makers select the right IP-based voice, video, fax and unified communications solutions to improve their operations. It's also where service providers learn how to profitably roll out the services their subscribers are clamoring for – and where resellers can learn about new growth opportunities. To register, click here.

Cheryl Kaften is an accomplished communicator who has written for consumer and corporate audiences. She has worked extensively for MasterCard (Tweet - Post) Worldwide, Philip Morris USA (Altria), and KPMG, and has consulted for Estee Lauder and the Philadelphia Inquirer Newspapers. [69]

GHG avoidance fallacy:

Cost and Quantity of Greenhouse Gas Emissions Avoided by Wind Generation*Author:* Lang, Peter

Wind power is intermittent, so either energy storage or constantly, instantly available back-up generation is required to provide constant power.

This paper contains a simple analysis of the amount of greenhouse gas emissions avoided by wind power and the cost per tonne of emissions avoided. It puts these figures in context by comparing them with some other ways of reducing greenhouse gas emissions from electricity generation.

The conclusion: wind farms connected to the National Grid provide low value energy at high cost, and avoid little greenhouse gas emissions:

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2. Wind power is a very high cost way to avoid greenhouse gas emissions.

3. Wind power, even with high capacity penetration, can not make a significant contribution to reducing greenhouse gas emissions.

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[69] http://green.tmcnet.com/topics/green/articles/210965-clearedge-raises-735m-expansion-commercialization-chp-fuel-cell.htm

About the Author

Peter Lang is a retired engineer with 40 years experience on a wide range of energy projects throughout the world, including managing energy R&D and providing policy advice for government and opposition. His experience includes: coal, oil, gas, hydro, geothermal, nuclear power plants and nuclear waste disposal (6.5 years managing a component of the Canadian Nuclear Fuel Waste Management Program) [70]

Conclusion

As usual, the overwhelming number of projects, the lack of time, health, and cooperation of technology and satellite internet service, and operator error, has resulted in these comments being submitted at the last minute.

Bottom line--The BLM and County must comply with NEPA, CEQA, and plain common sense. The key wording in Executive Order 13212 is *"production and transmission in a safe and environmentally sound manner". The Key word in Section 211 of the Energy Policy Act of 2005 and is "goal"*

Class L (Limited Use) lands protect "natural, scenic, ecological, and cultural resource values." The lands are supposed to be "managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished."

Within the law, the BLM *cannot* find Ocotillo Wind consistent with the CDCA Plan, Federal Endangered Species Act, Native American Religious Freedom Act, other cultural resource management laws and regulations, Executive Order 12898 regarding Environmental Justice, and Executive Order 13212 regarding potential adverse impacts of energy development, production, supply and/or distribution.

Nor can the County legally support this project knowing the financial burden, hardships, and level of risk they would be placing the public health and safety that of their own constituents in--for a project that does not even serve Imperial County residents, and companies that are not based in Imperial County and do not give a flying hoot about the incredible damage to people, wildlife, places, and things, that they are proposing to engage in.

We all know there are far better alternatives that must prevail in order to leave something good for those who follow us into the future.
Sincerely,

Donna Tisdale,
BAD President
POC Secretary
ECCAC Member

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[70] http://carbon-sense.com/wp-content/uploads/2009/02/wind-power.pdf

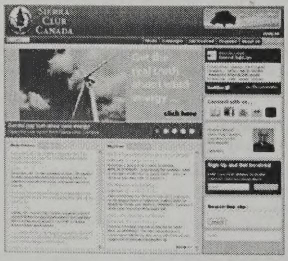
Critique of
The Real Truth About Wind Energy
An Analysis of the Potential Impacts of Wind Turbine Development in Ontario
Produced by the Sierra Club of Canada
May 2011, updated June 2011

by Wayne Gulden
wayne@windfarmrealities.org
July 2011

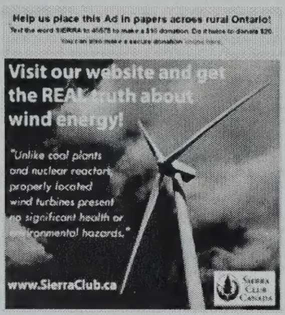
Background

The Sierra Club of Canada (SC) has long been a vocal opponent of nuclear and fossil fuel electricity generation. This stance has left them with a problem: assuming they don't want to return to the living standards of the 19th century, exactly how will we generate the energy we need for our modern economy? Their answer is to aggressively promote renewable technologies – and since they don't much like hydro either this ends up being solar or wind. They were an early and fervent supporter of Ontario's Green Energy Act, which set up the framework to install and pay for large amounts of renewable energy. As the Ontario government has placed some of the resulting wind projects in Important Bird Areas, executive director John Bennett has come under increasing criticism for his apparent indifference to the inevitable deaths and destruction of habitat of some of Ontario's iconic and even endangered species.

In response to his critics he gave a couple of interns the task of writing a report to buttress his support of wind energy. This report features prominently on the SC's home page:



The SC is also collecting donations to start the following ad campaign:



Help us place this Ad in papers across rural Ontario!

Text the word SIERRA to 45678 to make a $10 donation. Do it twice to donate $20.

You can also make a secure donation online here.

Visit our website and get the REAL truth about wind energy!
"Unlike coal plants and nuclear reactors, properly located wind turbines present no significant health or environmental hazards."
www.SierraClub.ca
Sierra Club Canada

In addition Bennett's been out stumping Ontario for this Report. As an example, from near Napanee: http://www.thewhig.com/ArticleDisplay.aspx?e=3194057&#postbox with http://windfarmrealities.org/wfr-docs/whig-article-110630.pdf as a backup.

The Quick Summary

The Report "encourages anyone with interest to seek [the references] out…" and I decided to do just that. There are a total of 61 references cited in the report and another 13 works consulted. I've located all of those that were of interest (not everything they wrote was important and/or controversial), read through them, and tried to get a sense of just how justified the Report's conclusions were.

The Report itself (a pdf, about 1.3MB) is available from the Sierra Club at: http://www.sierraclub.ca/sites/sierraclub.ca/files/wind_report_0.pdf with a backup at http://windfarmrealities.org/wfr-docs/sierra-club-wind-energy-report-v1-2011.pdf

It runs 44 pages including all the typical addenda and is a well-written review of the major issues concerning wind energy – from a proponent's perspective. When searching for the "Real Truth" you'd think a researcher would look at and use references from both sides of an issue, and use those references to form his ideas. I'm pretty familiar with most of the studies opponents use to make their points. Out of the total of 61 cited references NONE were from a source that was critical of the wind industry, and only 1 (Salt) was found among the 13 additionals.

So right away this was not an honest attempt to determine any Real Truth. Like every one of the proponent studies I've critiqued before, they started with a certain point-of-view and then found references to support that position. The bulk of references used here contain assertions, unsupported by any actual evidence, from proponent-friendly sources, many of which have a political or economic stake in the wind energy industry. The few references that are from disinterested parties uniformly have their conclusions stretched to the breaking point to support the proponents' perspective.

Like Bennett, I encourage you to read through the Report and follow the references to see if this Report presents the Truth, the Real Truth, or any plausible version of the Truth.

Some Administrative Trivia

Before I get into the grueling details let me cover how this critique was put together. I read through the Report and noted 51 passages that are representative of the problem areas of the Report. I created a modified copy of the Report with these passages marked in red, and it would probably be easiest to view both this critique and the modified report alongside each other. The modified Report is at: http://windfarmrealities.org/wfr-docs/sierra-club-wind-energy-report-v1-modified-2011.pdf Unfortunately, between the conversions into and out of Word, the size grew from 1.3MB to 5.6MB. This way you can see if I've taken anything out of context.

In the next section, "Grueling Details" I'll go through each passage and explain why I have problems with it, or in some case just want to comment. Someone would really have to be a glutton for punishment to go through all 51. In lieu of that, how about picking a few that seem interesting, then read them and follow through to the references to see if I've misrepresented anything. Do that a couple of times and you'll have a pretty good idea of this Report's value.

Along with reading the Report itself I also collected and read the most important of the Report's references. To make it easier for my readers I've noted problems with the links they supplied, supplied current links where needed and gathered a set of backup copies – all these links are at the bottom of this critique, in the "Report's Cited References" section. I spent a lot of time getting all these links and backup copies together. Unlike the Sierra Club I want to make it as easy as I can for my readers to take a look at the references they used and how they are used, so they can discover for themselves just how careless with the truth this report is.

The June 2011 Report is its second version, released only a month after the first. It is quite a bit larger with 61 cited references in place of the original 42; 44 pages in place of the original 37. Much of the new report is unchanged from the old, but there have been four new "sections" added: the Ontario FIT program, bats, prevention/mitigation and social separation.

One sentence that was removed from the first version was "We have further found, the research being used by opponents of wind to be either poorly interpreted or anecdotal at best." In the first place it was interesting that they found this, seeing as they hadn't (and still haven't) cited any "research being used by opponents…" Wouldn't you think, if you accused your opponents of shabby research, you'd document where the shabbiness was? Or, when filled with the righteousness of the renewable religion, is fair play not required? In the second place, I wonder why they removed it.

The Grueling Details

#1 (p.4) After a thorough review of the science we are confident in saying there is no evidence of significant health effects
This is demonstrably untrue. Any thorough review of evidence would have included references like Harry, Pierpont and Nissenbaum, unless you dismissed them out-of-hand since they didn't fit your agenda. You might try to re-define the word "evidence" to mean just peer-reviewed journal-published data, but even that doesn't work: http://windfarmrealities.org/wfr-docs/Health_Canada_Nova_Scotia.pdf

#2 (p.4) With a full review of available data, including that referenced by wind opposition groups
This is demonstrably untrue. If the SC reviewed any data reference by wind opposition groups it is not reflected in this report. You can't just say you reviewed and dismissed that kind of data without specifying exactly what you did review and why you dismissed it. Here's a sample of the sort of presumably dismissed data I'm referring to: http://windfarmrealities.org/wfr-docs/krough-compilation-2011.pdf

#3 (p.4) a link between well-sited wind turbines and health concerns is unfounded
Many proponents fall back on the "well-sited" excuse – so if a project causes problems, it's not because the technology is incredibly intrusive. Rather, it wasn't well-sited. This argument would be stronger if they ever opposed a badly-sited project before it was built.

#4 (p.5) This literature review
At least the SC had the grace to call this what it is – a literature review. Unfortunately, literature reviews are supposed to be reasonably exhaustive, and this was hardly that. 61 highly-selected references for all these issues is not exhaustive.

#5 (p.7) Anthropogenic climate change is now a well documented phenomenon
Curiously, I generally agree with this. We do need to quit burning every bit of hydrocarbon we can find. Which is why I'm against wind turbines. They do an incredible amount of environmental, social and financial damage and adding insult to injury haven't even demonstrated where they've ever cut any emissions. They are an expensive diversion and when discovered as such they will make the tough political decisions that must be made even tougher.

#6 (p.9) every 1 MWh of electricity generated by a wind turbine equates to a reduction of 0.8-0.9 t in greenhouse gas emissions when compared to a power plant producing electricity from either coal or diesel (Statistics Canada, 2009)
This one is really a mess. Statistics Canada itself knows nothing about GHG emission reductions, so where did they get this information? The above quote is contained in section 1.4.4 on p.47, and, sure enough, refers us to NRCan (ref#68). Unfortunately, the trail stops here. The link rolls you over to CanmetENERGY, where you can search, but I cannot find the referenced document. This sort of thing is typical of sloppy research. Instead of tracking down the references to see if there's anything more than a chain of assertions (or broken links), researchers-with-an-agenda generally just grab the first one

that sounds good and run with it. Perhaps they are betting that nobody important will ever actually read their report and follow the references. Sadly, this is usually a pretty good bet. In this particular case it gets worse. SC used the 2007/2008 statistics report when the 2009 report was available. Why? Because the 2009 report makes no mention of any wind emissions savings at all. This is also typical of these reviews – find what sounds good and go on, never minding if it has any real basis, or if it is still supported.

So what is the real answer to this most important of questions? The sad answer is that nobody really knows, and that certainly includes the Sierra Club. Plus it varies greatly grid by grid, with Ontario's being particularly ill-suited. For a real introduction see: http://windfarmrealities.org/?p=20 and for more meat go to http://www.masterresource.org/category/windpower-emissions-reduction-wind/

#7 (p.10) The strictest standards in North America are already in place in Ontario for the protection of citizens from any potential harm due to wind turbines (MOE, 2011).
This is demonstrably untrue. There are larger setbacks and lower noise limits in various jurisdictions, especially for property line setbacks. See: http://windfarmrealities.org/wfr-docs/sws_symposium_presentation_no_global_standards.pdf

#8 (p.10) These regulations were put in place with the intention of eliminating any disturbing noise from wind turbines by keeping sound levels below 40dBA in all nearby residences. They are also designed to provide adequate distance to avoid any damage or injury due to malfunction, regular maintenance or blade icing
Both of these assertions are demonstrably untrue. Ontario's noise limits are set by the MOE Interpretation, at http://windfarmrealities.org/wfr-docs/moeinterpretation.pdf. In Table 1, page 6 you can see that the max dBA is as high as 51, depending on the wind speed. The theory is that the noise from the wind will "mask" the noise of the turbine. With smaller turbines that may work ok, but with the new larger turbines, which produce more low-frequency sounds, it doesn't. Worldwide, only Ontario still permits this masking exemption. Petersen (2008) reported "*The studies show that the sound levels vary at the same wind speed, and that wind turbine sound could still be heard at wind speeds when it should be masked by other wind-induced sounds.*" Larger turbine link: http://windconcernsontario.wordpress.com/2011/06/24/new-danish-study-backs-wind-turbine-noise-complaints/

The Ontario safety setback is blade length + 10 m, or about 60 m total. However, King (2010) reports that "*Sizable ice fragments have been reported to be found within 100 metres of the wind turbine*" and "*The maximum reported throw distance in documented turbine blade failure is 150 metres for an entire blade, and 500 metres for a blade fragment.*" So exactly how is 60 m sufficient to protect the public? Copes (2010), p.1 says setbacks of 200 to 500 m can minimize risks. The Province is simply playing the odds, gambling with public safety, apparently with the SC's blessing

#9 (p.12) Figure 3: Typical Sound Pressure Levels (Colby et al, 2009, p.12)
First off, there's no page 12 in Colby (2009). It is really Table 3-1 on p.3-2. What was that chart based on? Colby refers us to http://www.dec.ny.gov/docs/permits_ej_operations_pdf/noise2000.pdf and sure enough there's a similar chart on p.19 of that report. And where did they get their information from? Something called the "aggregate handbook", published in 1991. The chart isn't controversial, so why am I even bringing this up? Just that it shows sloppiness. SC could just as easily have found a chart that didn't ultimately rely on a 1991 handbook.

#10 (p.12) somewhere between the quiet of a bedroom and a calm house.
Technically, I suppose a turbine's 45 dBA is between the 25 dBA of a quiet bedroom and the 50 dBA of a calm house. But it is misleading, and I think intentionally so – an honest statement would find a halfway point. Further, how does the SC know a turbine actually falls at 45 dBA? And at what distance? 45 dBA is a common number from proponents, usually at 350 m, but they seldom mention that the 45 dBA is a modeled number, not a measured one. If you want a measured one, try this: http://windfarmrealities.org/wfr-docs/ashbee-measurements.pdf

#11 (p.13) It is understood that sound below the threshold of hearing has little if any effect on people
I read over their reference, Howe (2006, p.5) very closely and the only statement that came close to the above was "*In summary, there is no evidence to suggest that infrasound from wind turbines cause issues with respect to human perception or health.*" That isn't quite what the SC said he said. Plus Howe is an acoustician, not a medical doctor or researcher. According to other acousticians wind turbines are unique-enough that in some circumstances they just might be a problem, see: http://windfarmrealities.org/?p=962

#12 (p.14) This sound level is generally in the audible range (1000 to 20 000 Hz) and diminishes with distance: no more than 50dBA at 350 metres, and not exceeding 40dBA at 500 metres (Rideout, 2009).
I checked their reference and nowhere does Rideout (2009) specify wind turbine noise emissions vs. distance. Maybe they meant Copes (2010) – it's easy to get these confused. Regardless, how does Rideout or Copes know this to be true? Almost certainly they got their numbers from the industry, who in turn used computer models run by friends to generate them. The actual levels, in some fairly common circumstances, can be higher, much higher: http://windfarmrealities.org/wfr-docs/ashbee-measurements.pdf

#13 (p.14) It is generally accepted that in order for a noise to be audible and noticeable it must exceed the background noise of a given environment by approximately 5dBA (Rogers, 2006)
I checked their reference and I can't find where Rogers makes the above statement. About as close as he comes (p.6) is "*A change in sound level of 5 dB will typically result in a noticeable community response.*" and there's also "*Outside of the laboratory, a 3 dB change in sound level is considered a barely discernible difference.*" On page 20 he cautions "*It should be remembered that average sound pressure measurements might not indicate when a sound is detectable by a listener. Just as a dog's barking can be heard through other sounds, sounds with particular frequencies or an identifiable pattern may be heard through background sounds that is otherwise loud enough to mask those sounds.*" So much for masking, as per passage #8 above.

#14 (p.15) In this situation, in buildings located at the minimum mandated set back distance, most people would be able to hear the wind turbines, but annoyance would be minimal (Rogers, 2006)
I looked through Rogers for quite a while and I couldn't find anything even close to this. Curious about this disconnect, I checked the first version of this report, and lo and behold, I find the exact wording, albeit without the Rogers attribution. You'd think that in a real literature review that the ideas would flow from the literature to the report. In this case, and with #13 above, it seems that the SC started with the ideas and went looking for affirmation from otherwise reputable sources – and the Rogers paper, being quite good within its scope, is widely quoted. I'm sure they were betting that nobody would bother checking it out, but in this case they lost the bet. In a college class, they would have just failed the course.

As an additional thought, one wonders who should be the judge of what "minimal" consists of.

#15 (p.15) These studies were done on wind farms where houses were found within visual distance of wind turbines.
This is a trivial point, but it shows sloppiness. Both Swedish studies that Pedersen ran used a 30 dBA cutoff for their study areas. From Pedersen 2010, p.16, "*...each household that were exposed to 30 dB(A) or more from the wind turbines.*"

#16 (p.15) For our purposes we will look at the groups around the limits in Ontario
They're referring to the groups around 40 dBA, the presumed Ontario limit. Except that the Ontario limit is really 51 dBA, depending on wind speed.

#17 (p.15) By maintaining the limit of 40 dBA most people will hear the sound of a wind turbine, but very few if any will be annoyed and there are no negative health effects (Pederson, 2008)
I've looked closely at the equivalence of Pedersen's studies to Ontario's situation, and using her results in Ontario is invalid. For more details, please see: http://windfarmrealities.org/?p=1201

#18 (p.15) The same study found an interesting correlation between those who benefited financially from windmills and reduced perception/annoyance levels even with closer proximity and higher sound levels.
While they don't explicitly say so, their clear intent is to convey the idea that money will make the annoyance go away, ergo the annoyance isn't real to begin with. What they don't consider is that maybe, just maybe, there's some third factor at play. In Pedersen 2008, p.56 there's this quote: "*Respondents that benefit will more usually have control: most or all of them have taken part in the decision to put up the turbines and they can stop them if they want. One respondent remarked that if a turbine close by caused too much noise for him or his neighbour,* ***he stopped the turbine.***" [My emphasis]

Because most of the benefiters lived closer to the turbines, this ability to control the turbines also skewed the annoyance measures of the loudest categories, per section 7.3.2 on p.31. To apply the results of this study to Ontario is dishonest.

And being able to control your environment is what your home is all about, isn't it?

#19 (p.15) It also found that those who did not like windmills to begin with, or who found them to be unattractive were more likely to notice and be annoyed by the sound of the wind turbines (Pedersen, 2008)
The way the SC wrote it, the attitude caused the annoyance. This is incorrect. From Pedersen 2008 p.45 there's this: "*Other factors, such as attitude, are more ambiguous: we do not know if the attitude has an influence on annoyance or if annoyance leads to a negative attitude. The statistical tests can only show whether there is a relationship between attitude and annoyance, not which one is the cause and which one the effect.*"
The SC has made the basic error of confusing correlation with causation. Pedersen 2010 is even more adamant about making this error, per the bottom of p.24.

#20 (p.15) Several studies have similar findings, showing perception and annoyance occurring around the 40dBA threshold, the limit set by the Ontario government
By "several studies" I assume they mean the two Pedersen studies in Sweden and the VandenBerg/Pedersen study in the Netherlands. None of these studies are even very close to duplicating Ontario's situation. See passages #17 and #18 above.

#21 (p.16) In the case of wind farms however, several peer-reviewed articles conclude that infrasound is inaudible and thus has no noticeable effect on people (Colby, 2009)(Howe, 2006).
This is a commonly-expressed theme among proponents: if you can't hear it, it can't affect you. This is nonsense, akin to saying if you can't see it, it can't affect you. Never mind radiation or even sunburn. The Salt (2010) paper put an end to this nonsense, but even though the SC included his work in the supplementals, the importance of his work didn't filter through to the Report's conclusions. For a presentation of his findings, see: http://windfarmrealities.org/wfr-docs/sws_symposium_presentation_infrasound_your_ear_hear_it_2.pdf
and I've got a copy of the 2010 paper if you need it.

#22 (p.16) "Specific International studies, which have measured the levels of infrasound in the vicinity of operational wind farms, indicate that levels are significantly below recognized perception thresholds and are therefore not detectable to humans." (Sonus Pty Ltd. 2010)
Sound, especially infrasound, travels in strange ways sometimes. What you never see published are measurements in a home where people are complaining or have abandoned. For the "not detectable" idea, see passage #21 above. Except the Ashbee numbers from #12 above, which slipped out by accident

#23 (p.17) Additionally, there is no evidence of adverse health effects due to infrasound from wind turbines. (Howe, 2006, p.11)
The above quote was actually on Howe's page 8; its PDF page number happens to be 11.

I'll restate that Howe is not a medical doctor, and the evidence he has looked at is also not from medical doctors. He's making an acoustician's assumption - that what you cannot hear cannot harm you.

#24 (p.17) This annoyance may cause sporadic waking throughout the night, though no effects beyond this are seen to be the results of wind turbine noise (Copes, no date).
Assuming I've got the right Copes reference (their link is incorrect), the closest to the above I can find is from his conclusions, slide #41, "*No evidence of noise-induced health effects at levels emitted by wind turbines.*" What the SC left out was several other conclusions, such as "*Health concerns are valid and must be addressed.*" and "*Any effects on health more likely related to annoyance/sleep disturbance than to direct effect of SPLs at residence.*"

This is similar to the "direct" effects that Colby and King talk about. Just because the noise doesn't itself cause damage (and that's still up for discussion, i.e. Salt and Pierpont) they must think it is ok to stress, annoy and disturb the residents so much that their health becomes an issue. Copes and Rideout themselves have commented on this issue as well: http://windfarmrealities.org/wfr-docs/rideout-copes-statement.pdf

#25 (p.17) Several publications have linked the negative perspective toward wind turbines with adverse reactions to sound; those who don't like wind farms, or the look of wind turbines tend to notice and be annoyed by the sound of windmills significantly more than anyone else (King, 2010).
The SC is simply repeating King, who in turn is simply repeating Pedersen. And Pedersen's studies simply don't much apply to Ontario, for reasons contained in passage #19 above. Plus notice the use of the word "link". They are implying causation when Pedersen herself has explicitly said not to.

#26 (p.17) Though both of these distances are well below Ontario's setback regulations
This is demonstrably incorrect. 250 m is NOT below the ~60 m safety setback. King seems to not understand Ontario's actual regulations, and the SC has aped her misunderstanding.

#27 (p.18) With the sun in the background, large moving shadows can be produced which some people may find distasteful
"Distasteful"? I can think of a lot of adjectives to describe flicker, but distasteful is not among them. I've never experienced it myself, but people who have say it is very disturbing, sometimes forcing them out of the affected rooms. Here's a link to some videos, take a look and see what you think:
http://www.wind-watch.org/video-wisconsin.php

#28 (p.19) This effect can however be prevented with proper placement of wind turbines to avoid the particular setup necessary to create this effect.
This is technically correct, except that Ontario has no regulation regarding flicker, and asking the developer to voluntarily go out of his way and decrease his profits to help the neighbors is naïve.

#29 (p.19) First, as wind turbines are 80 to 100 metres above the ground the EMF created by the production of energy is generally well above any people who may be in the area.
First, presently there is NO production of electricity in these areas, and the highest existing voltages and currents are much less than what a wind project creates. Generally the existing infrastructure isn't designed to handle these loads. Second, the EMF problems I've read about don't spread through the air, but rather through the inadequate wires, so their point about how far away the generator itself is isn't important. For some pictures of what a nearby project can do to the waveforms go to
http://www.dirtyelectricity.ca/wind%20turbines.htm

#30 (p.19) This report states that in 2008, air pollution was responsible for 21,000 deaths in Canada (CMA, 2008, p.iii). 90,000 people will have died from acute effects and 710,000 will have died from long-term exposure to air pollution by 2031, with the highest number of deaths from acute exposure in Quebec and Ontario (CMA, 2008, p.iii). In 2008 air pollution was responsible for 620,000 visits to doctors offices, and 92,000 emergency room visits, while these numbers are expected to rise to 940,000 and 152,000 respectively in 2031 (CMA, 2008, p.iii).
These numbers are presented as facts in the "At a Glance" section of the cited reference. What isn't apparent is that nobody ever actually checked any records to see if these "facts" were accurate. Instead, they were generated with computer models, as specified in the longer technical report, available at:
[illegible]
Dr. Ross McKitrick has analyzed these models and the history of Ontario's air pollution and has summed up his findings in this presentation:
http://windfarmrealities.org/wfr-docs/awv_symposium_presentation_where_are_the_bodies.pdf
In short, he found that the models are faulty. In addition, Ontario's pollution problems are already pretty much as fixed as Ontario can fix them. Wind will do nothing to improve anything. In fact, according to measurements by Bentek, wind will make things worse: http://windfarmrealities.org/wfr-docs/bentek-less-become-more.pdf

#31 (p.20) The capacity factor for renewable energy falls within the range of conventional generation techniques and indeed has a higher capacity factor then hydroelectric generation
This is disingenuous. Capacity factor is not the critical difference – dispatchability is. Nobody pretends that wind energy is dispatchable. The other fossil fuels may have lower capacity factors because the system operator (the IESO) CHOOSES to use them sparingly. Not so with wind and solar.

#32 (p.20) Renewable (Solar, Wind, Biomass) - 40%
Ontario's experience is that the annual Capacity Factor for wind is typically between 25 and 30%, most of it coming when it isn't needed.

#33 (p.20) While wind speed can vary, it "can be quite accurately forecast in the appropriate timeframes for balancing electrical supply" (Sustainable Development Commission, 2005, p.22).

The above quote is merely an assertion, with nothing to back it up. Returning to the real world, the Bonneville Power Authority (BPA) publishes its forecasts and actual production. So far their real-world experience hasn't been so good, as detailed at: http://windfarmrealities.org/?p=362 where the only time the forecasts are accurate is when there's no wind.

#34 (p.23) The development of wind energy in Europe has created many new jobs
What is left off is how many jobs were destroyed by higher energy prices. For each "green job" produced, the following numbers of jobs were destroyed:
England, 3.7, Spain: 2.2, Italy: ~6, the list goes on:
http://www.instituteforenergyresearch.org/2011/05/09/the-wind-experience/

#35 (p.23) It has been estimated that if the environmental externalities associated with generating electricity from fossil fuels was included in their cost, the price of electricity generated from coal and oil would double, and the cost of electricity generated from gas would rise 30% (EWEA, [No date], p.6)
This assertion is from the European Wind Energy Association, an industry lobbyist. Why something from a lobbyist is included in a report claiming to portray the "Real Truth" escapes me. EWAE, in turn, got this assertion from an EC-supported study group called ExternE, at http://www.externe.info . And how did ExtrenE calculate their numbers? You'll have to dig that one out yourself if you care enough. Judging from some of the language from their home page, "societal welfare principles" and "intended as a strategy to rebalance the social and environmental dimension," I suspect they wouldn't get much of a reception in North America.

#36 (p.23) If subsidies to the fossil fuel and nuclear sector were removed the renewable energy sector would not require any subsidies to be competitive (EWEA, [No date], p.6).
This is demonstrably untrue. Perhaps they redefined the word "subsidy" to where it excludes anything the wind industry gets. The EIA, hardly an anti-wind organization, has calculated the various subsidies and, no surprise, wind and solar lead the pack:
http://www.eia.gov/energy_in_brief/energy_subsidies.cfm

#37 (p.24) These subsidies were gradually reduced until they were no longer required by 1989 (Andersen, 2008, p.10).
This is demonstrably untrue. Here's the entire paragraph from which the above quote was taken. "*Two elements were used to create a market for wind turbines in Denmark. The first element was to give the private buyers of turbines a start-up subsidy. From the introduction in 1979 was 30 % of the total cost. The subsidy was then gradually decreased until it vanished in 1989. The second element was to force the utilities to buy the electrical power at a certain price.*" The SC forgot to mention the second part of the subsidy, which continues to this day.

#38 (p.24) The land surrounding the wind turbines can remain as natural habitat or agricultural land (Andersen, 2008, p.12).
What is left unsaid is that the land surrounding the wind turbines will NOT remain as residential or recreational, where a significant number of Ontario turbines are being placed. Further down the page Andersen says "*The nuisance caused by turbine noise is one of the important limitations of siting wind turbines close to inhabited areas.*"

#39 (p.24) Many of the materials wind turbines are made of can be recycled, and no decommissioning issues are associated with wind turbines (Andersen, 2008, p.11).
Not quite. Here's the paragraph from Andersen: "*Electricity from wind turbines has no liabilities related to decommissioning of obsolete plants. Today, most metal parts of wind turbines can be re-cycled. In a very near future other parts, such as electronics and blades, will be recycled almost 100p.c.*" It is quite a leap from "no liabilities" to "no decommissioning issues". If you think there's no issues, take a look:
http://www.youtube.com/watch?v=SFqNLzOyT4I&NR=1

#40 (p.24) it can be seen when comparing generating types that wind generation is far less damaging to wildlife populations throughout the entire generation cycle (Newman and Zillioux, 2009, p.3-1).
What was left unsaid was Newman's own caution: "*No attempt was made to compare relative risks by considering electricity generation sources of the same size, such as risk per megawatt (MW).*" And given the low density of wind vs other production methods, "*Such a comparison is not likely to be realistic.*"

#41 (p.24) wind turbines actually have a comparatively low impact on the number of birds that die every year from human causes (Erickson et al., 2005, P 1029).
If one considers the total number of birds killed by humans over the course of a year this is a true statement. But I'm not aware of anyone who has expressed concern over the total numbers. The problem is that some species are disproportionately affected by ill-placed projects, with raptors coming immediately to mind. Also, projects placed along major migration routes can cause substantial damage to certain populations, many of which are already under pressure. The American Bird Conservancy has this page: http://www.abcbirds.org/abcprograms/policy/collisions/wind_farms.html and Eagle International has this: http://bidrek.newsvine.com/_news/2011/03/29/6368865-save-the-eagles-international-issues-warning-about-extinction-by-wind-turbines

#42 (p.25) properly-sited
This is Audubon's escape card. It's time to ask the SC: just what would constitute a not-properly-sited project? Apparently Wolfe Island, Ostrander Point, Amherst Island and White Pines didn't make the cut. And if they didn't, what on earth would? Wolfe Island has been a disaster: http://windfarmrealities.org/?p=760

#43 (p.26) These improvements in understanding are already improving bat fatality rates and will continue to improve.
Really? I'd feel a lot better if there was some evidence, some reference, to back this assertion up. While raising the cut-in speed shows promise, I have yet to see any studies showing where it has been successfully implemented.

#44 (p.26) requires certain procedures to be followed during the pre-construction, construction and post construction phases of wind turbines and wind farms in order to mitigate bird and bat deaths
These procedures so far have been a joke, MNR is responsible for overseeing Wolfe Island. In that period a major raptor habitat has been destroyed, and so far the only thing the MNR has done is to require more studies. Here's the current situation:
http://www.torontowindaction.com/owls_disappearing.html

#45 (p.27) During this 3 year monitoring period the following fatality thresholds are laid out.
How were these levels set? They start out by claiming (section 4.1, p.10) "*Studies indicate that turbine-related mortality maintained below these thresholds is unlikely to affect bird populations.*" Except they never say what studies they are referring to. The truth oozes out in the very next sentence "*Thresholds have been established based on the highest reported bird mortality at wind power projects in North America, outside California.*" What really happened was that Wolfe's actual rates were so high they reset the thresholds so they could say that those rates were within the limits experienced at other projects. There was never even an attempt to see if they were sustainable. Here's a story of the predictable results:
http://www.torontowindaction.com/owls_disappearing.html
And still the MNR does nothing.

#46 (p.28) The best technique to avoid wildlife fatality and loss of habitat is good siting and placement of wind turbines.
But who will enforce that? Certainly not the Ontario government, who has so far approved 4 projects in IBA's. With the SC's blessing.

#47 (p.28) This new plan should increase bird monitoring as well as decrease bird fatalities in the area. (APWRA, 2011)
This is a worthless assertion, having nothing to do with any reality. Birds are continuing to get slaughtered at Altamont and Tehachapi.
http://www.usatoday.com/news/nation/environment/2009-09-21-wind-farms_N.htm

#48 (p.31) Renewable electricity generation can potentially be seen to be reversing this trend.
This is almost beyond irony. This passage was part of an added section dealing with the problems caused by the separation of source and consumption of electricity, and how renewable generation can fix this problem. Hello, Sierra Club! Putting wind turbines and solar panels in the countryside to feed the cities is the ultimate expression of this problem. You surely don't think they'll be putting projects in the suburbs, do you? They won't even put high-density gas plants in the cities.

#49 (p.31) The Chief Medical Officer of Health (CMOH) of Ontario Dr. Arlene King
Dr. King's report has been thoroughly critiqued, first by the Society for Wind Vigilance, at http://www.windvigilance.com/cmoh_analysis_media_release.pdf and also by myself, at http://windfarmrealities.org/wfr-docs/king-journal-references.pdf Just because an author has some amount of authority/gravitas, it doesn't mean anything she says is true. Remember that her boss is McGuinty.

#50 (p.32) A panel of three judges has ruled that Ontario's approach to wind turbines protects human health and the environment. The province's 550 metre setback for wind turbines is the strictest in North America and based on peer-reviewed science.
NO. The quote you see was from the MOE, not the judge. And of course the MOE embellished the decision to suit their agenda. The actual decision is at http://windfarmrealities.org/wfr-docs/hanna-decision-2011.pdf The judge merely ruled that there was a process that was followed, and "*It is not the court's function to question the wisdom of the minister's decision, or even whether it was reasonable.*"

#51 (p.32) no member of the public has ever been harmed by wind turbines." (CanWEA, 2008)
This is demonstrably untrue. As an example there have been two known public fatalities caused by wind projects. The first was a parachutist in Germany and the second was a crop-duster in California. I'm surprised CanWEA hasn't taken that statement down, and a little surprised that the SC used it without checking it out. After all, they were after the Real Truth, weren't they? Accepting an assertion from a lobbyist at face value is almost never the way to the Real Truth, is it? Paul Gipe, a major wind promoter, keeps an account of accidents at
http://www.wind-works.org/articles/BreathLife.html but it hasn't been updated for some time, and here's a story about the crop duster:
http://sanfrancisco.cbslocal.com/2011/01/10/fatal-crop-duster-crash-near-bradford-island/

Summary

This entire report, with its "Real Truth" emphasis, makes a mockery of any concept of truth. The Sierra Club started out to write something, anything, that justified their continuing support of wind energy in Ontario. They then went out looking for supporting references, or at least references that could be made to appear to support their justifications.

In passage after passage, all 51 of them, I showed where their research was incomplete, biased, sloppy, even borderline fraudulent. And after preparing this miserable excuse for a report, they then have the gall to present it to the world as the "Real Truth about Wind Energy". The quicker this report dies the better, and not just because it is pro-wind-energy. The Sierra Club could be a valuable resource in protecting – really protecting – our environment, but not given its current behaviour. The longer this farce continues the higher the risk that the Sierra Club will find itself increasingly irrelevant, and that would be a shame.

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Cost and Quantity of Greenhouse Gas Emissions Avoided by Wind Generation

By

Peter Lang

This paper contains a simple analysis of the amount of greenhouse gas emissions avoided by wind power and the cost per tonne of emissions avoided. It puts these figures in context by comparing them with some other ways of reducing greenhouse gas emissions from electricity generation.

The conclusion: wind farms connected to the National Grid provide low value energy at high cost, and avoid little greenhouse gas emissions.

The paper covers the following:

1. Background
2. Electricity generation cost per MW-h
3. Greenhouse gas emissions per MWh
4. Emissions avoided per MWh
5. Cost of emissions avoided per MWh
6. Comparison with other options to reduce emissions from electricity generation
7. Discussions
8. Conclusions
9. References
10. About the Author

Background

Wind power is intermittent, so either energy storage or constantly, instantly available back-up generation is required to provide constant power.

Wind power is proportional to the cube of the wind speed. So a small drop in wind speed causes a large drop in the power output. For a modern 2.1 MW wind turbine a 2 m/s drop in wind speed from 9 to 7 m/s halves the power output.

The wind speed is very variable. Figures 1 and 2 give examples of how variable it is.

Figure 1 – The variability of wind power

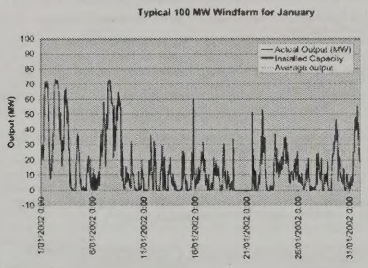
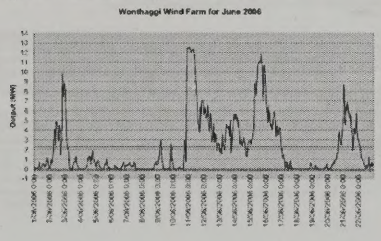


Figure 2 – the variability of wind power



Energy storage[1] is completely uneconomic for the amounts of energy required. So we must use back-up generation.

Constantly, instantly available back-up must be provided by reliable energy sources (to provide power whenever the wind speed drops). Coal, gas, hydro and nuclear power provide reliable power, but not all are suitable as back up generators for wind power.

Back-up generation is mostly provided by gas turbines in Australia. The reasons why gas provides the back-up rather than one of the other energy sources are:

1. We have insufficient hydro resources to provide peak power let alone provide back-up for wind power. Hydro energy has high value for providing peak power and for providing rapid and controllable responses to changes in electricity demand across the network. So our very limited hydro resource is used to generate this high value power.

2. Coal generates the lowest cost electricity and, therefore, coal generation is the last to be displaced when a new source of electricity becomes available (such as when the wind blows). That is, when wind energy is available it displaces the highest cost generator first. Coal is displaced last.

3. Coal generators cannot follow load changes rapidly. Brown coal power stations (as used in Victoria) are designed to run at full power all the time. They can only reduce power by venting steam, but they continue to burn the same amount of coal and hence produce the same amount of emissions whether or not they are generating electricity. Black coal power stations have some limited capability to follow the load but cannot follow the rapid changes in wind power.

4. Gas turbines can follow load changes fairly well but not as rapidly as the wind power changes. Gas turbines power up and down like a turbo-prop aircraft engine, but with slower response. Next to hydro, gas turbines are best able to follow the load changes created by wind power.

5. There are two classes of gas turbine: Open Cycle Gas Turbine (OCGT) and Combined Cycle Gas Turbine (CCGT). OCGT has lower capital cost, higher operating costs, uses more gas and produces more greenhouse emissions than CCGT per MWh of electricity generated. OCGT follows load changes better than CCGT. OCGT produces electricity at less cost than CCGT at capacity factors less than about 15% (ie 15% of the energy it would produce if running full time at full power). CCGT has higher capital cost and needs to run at higher power and run for longer to be economic. CCGT is more efficient so it uses less gas and produces less greenhouse emissions. CCGT produces electricity at less cost than OCGT for capacity factors above about 15%. (See figure 3)

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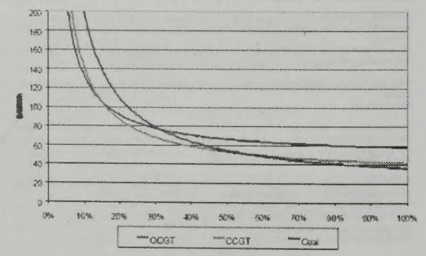
[1] http://www.greenhouse.gov.au/renewable/[illegible]review.pdf , Fig 13, p28

Figure 3
Source: "Long Run Marginal Cost of Electricity Generation in NSW, A report to the Independent Pricing and Regulatory Tribunal, Feb 2004"

Exhibit 1-2 Medium New Entry Cost Scenario as a Function of Capacity Factor (Medium Scenario)



The study noted the cross over points in the cost versus capacity factor characteristic. These cross over points represent the capacity factors where one technology becomes more economic than the next. The optimal capacity factors and the corresponding new entry costs for each technology are shown in Exhibit 1-3 below.

Exhibit 1-3 Optimal Capacity Factors and Associated New Entry Cost (Medium Scenario)

	Thermal Coal	CCGT	OCGT
CF	100%	55%	14%
New Entry Cost	$36.2/MWh	$53.9/MWh	$109.0/MWh

6. The ideal arrangement (grossly simplified) is
   a. Coal (and/or nuclear) generates base load power (24 hours per day);
   b. CCGT generates shoulder power (approximately 12 hours per day, but variable duration);

c. OCGT generates shoulder and peak power and follows the load changes (average less than 15% capacity factor);

d. Hydro generates peak power and provides stability to the grid.

7. If wind generation is available the power produced is highly variable and unscheduled so it needs to be backed up by OCGT. Although OCGT is called up to back up for wind, the energy produced by wind actually displaces CCGT generation mostly (see next section for explanation).

8. Because wind energy is variable, unreliable and cannot be called up on demand, especially at the time of peak demand, wind power has low value.

9. Because wind cannot be called up on demand, especially at the time of peak demand, installed wind generation capacity does not reduce the amount of installed conventional generating capacity required. So wind cannot contribute to reducing the capital investment in generating plant. Wind is simply an additional capital investment.

The Basis for Comparison

Wind generation displaces CCGT mostly. If we did not have wind power, CCGT would be the most economical and least greenhouse intensive way to generate shoulder power (non-continuous power). To explain, consider the following.

If governments did not mandate and subsidise wind power (by Mandatory Renewable Energy Targets and State based regulations and subsidies) then CCGT and OCGT would be installed in the optimum proportions to provide shoulder and peak generation (in excess of available hydro energy).

If governments mandate wind power then we will need more OCGT and less CCGT than without wind power. The substitution of OCGT for CCGT is (nearly) in proportion to the amount of wind capacity installed, not the amount of wind energy that will be generated. The reason is that the OCGT is required to back up for most of the wind power's maximum capacity, not for its average energy production. For example, if we install 100 MW of wind power, nearly 100 MW of OCGT must be installed instead of 100 MW of CCGT. (For more detailed explanation see "Security Assessment of Future UK Electricity Scenarios"[2]).

To estimate the cost of, and greenhouse emissions avoided by, wind generation we need to compare CCGT versus wind generation plus OCGT back-up.

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[2] http://www.tyndall.ac.uk/research/theme2/final_reports/t2_24.pdf

Electricity Generation Cost per MW/h

The cost of electricity generation by gas turbines for various capacity factors[3] is listed below:

	Generation Cost ($/MWh)	
CF	OCGT	CCGT
100%	60	40
45%	70	54
30%	78	67
15%	105	100

The cost of wind generation at 30% capacity factor is about $90/MWh (this figure does not include the cost of back-up). The figure is derived from the proponent's case to the NSW Land and Environment Court for a Wind Farm at Taralga, from ESAA[4], and from actual costs for wind generation in South Australia and New Zealand.

Cost of Back up Generation for Wind

The figure of $90/MWh for wind does not include the cost of back up, nor the cost imposed on the generators, the grid, and distributors caused by the variable and unreliable power. Some of the costs not included in the figure for wind power are:

1. The cost of the investment in generator capacity required to meet peak demand. Nearly the full amount of fossil fuel and hydro generating capacity must be maintained to meet peak demand. The investment in wind displaces almost no capital investment in conventional generating plant.

2. The fossil fuel generators must charge a higher price for their electricity to recoup the fixed costs of their plant over a lesser amount of electricity supplied (ie as they power down when the wind blows)

3. The cost of maintaining 'spinning reserve' - keeping the generators running ready to power up as soon as the wind speed drops. The costs are: fuel, operation and maintenance, and return on capital invested.

4. The cost of fuel for powering up each time the wind changes.

5. Higher gas costs. Most of the gas price is in the pipes, not the price of the gas at the well head. The gas supply pipes need to be sized to run the gas turbines at full power. When the OCGT is operating as back-up for wind it produces less power than optimum. The fixed cost of the gas pipes is spread over less MWh generated by the gas turbine. So the cost of gas and hence the cost of electricity generated must be higher to give an economic return for the generator.

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[3] "Long Run Marginal Cost of Electricity Generation in NSW; A report to the Independent Pricing and Regulatory Tribunal, Feb 2004", Exhibit 1.2.

[4] http://www.esaa.com.au/images/stories/energyandemissionsstudystage2.pdf

6. High-value, hydro-energy is wasted. With wind power connected to the grid extra hydro energy (some of it pumped to storage by coal fired plants during off-peak hours) has to be used to stabilise the grid, to provide fast response power when the OCGTs cannot power up fast enough, and to maintain a greater amount of spinning reserve. The rapid changes in wind power causes instability in the network. Some wind changes occur faster than the OCGT's can ramp up. Fast response hydro energy, from our limited reserves, is used to balance these load fluctuations.

7. The grid must be stronger to accommodate the greater variability imposed by the wind generators.

8. There are higher operational costs for the grid operators and distributors. For example, each distributor has a group dedicated to ensure the distributor buys enough renewable energy to meet its government mandated obligations. The full additional cost is millions of dollars per year and this is passed on to consumers in a higher price of electricity.

Assume that the cost of maintaining back up for wind generation is 50% of the cost of generating with the OCGT (i.e., $39/MWh based on the preceding figures and assumptions). Now we can calculate a cost of having wind power in the generation mix.

Option 1 – No Wind. CCGT generates 45% capacity factor – Cost: $54/MWh

Option 2 – Wind plus OCGT generates 45% capacity factor - Cost: $121/MWh (see table below)

	Capacity Factor	Rate $/MWh	Cost/MWh $/MWh
OCGT	15%	$105	$35
Wind	30%	$90	$60
OCGT Back-up for wind	30%	$39	$26
Total Wind and OCGT	45%		$121

The cost of CCGT is $54/MWh. The cost of wind including back-up is about $121/MWh. The difference is $67/MWh. This is the cost per MWh to avoid some CO2 emissions.

Analysis of a report by the UK Royal Academy of Engineering "The Costs of Generating Electricity"[5] gives similar figures.

	UK p/kWh	A$/MWh
CCGT	2.2	$51
OCGT	3.2	$74
Wind	3.7	$86
back up	1.7	$40
Wind with back up	5.4	$126

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[5] http://www.raeng.org.uk/news/publications/list/reports/Cost_Generation_Commentary.pdf

Greenhouse Emissions per MWh

The University of Sydney's Integrated Sustainability Analysis report[6] provides the greenhouse gas emission intensity factors for wind in columns 2 and 3 below. The fourth column (for 30% capacity factor and 20 year economic life) is calculated by factoring from columns 2 and 3.

Capacity Factor	31.2%	23.1%	30%
Economic life (yr)	25	20	20
Emissions Factor (t CO2-e/MWh)	0.021	0.040	0.027

Source: http://www.pmc.gov.au/umpner/docs/commissioned/ISA_report.pdf

The greenhouse gas emission factors for gas turbines from the same report are:

Generator technology	OCGT	CCGT
Greenhouse gas emissions factor (t CO2-e/MWh)	0.751	0.577

Emissions Avoided per MWh

If CCGT generated the power, the emissions would be 0.577 t CO2-e/MWh.

If Wind and OCGT generate the same amount of power, the emissions would be 0.519 t CO2-e/MWh (see table below).

	CF	Factor t CO2e/MWh	Emissions t CO2e/MWh
OCGT	15%	0.751	0.250
Wind	30%	0.027	0.018
Back-up for wind (assumed 50% of OGCT)	30%	0.376	0.250
Total Wind and OCGT	45%		0.519

Therefore, the emissions avoided by wind are: 0.577 – 0.519 = 0.058 t CO2-e/MWh

We can compare this figure with figures derived from two other sources.

First, the "South Australian Wind Power Study"[7] provides an upper bound figure. This study modelled the effect of introducing wind generation in South Australia on the amount of fossil fuel generation and the long run and short run marginal costs of generation across the whole National Electricity Market. The study also modelled the amount of greenhouse gas emissions saved, but points out that several factors are not included in the analyses. The study determined the amount of CO2 emissions avoided by wind, excluding emissions from providing back up, is about 0.5 t CO2-e/MWh. This can be considered as an upper bound, because the modelling does not consider:

- Emissions from maintaining 'spinning reserve' with back up generators;

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[6] http://www.pmc.gov.au/umpner/docs/commissioned/ISA_report.pdf

[7] "South Australia Wind Power Study" by Electricity Supply Industry Planning Council, March 2003.

- Emissions from powering up and running down the generators;
- Emissions from coal power stations when they are required to reduce power by venting steam (while they continue to burn coal and emit CO2 at their full rate);
- Emissions from generating the energy to provide reactive and feed-in power for the wind generators;
- Emissions from building, operating and maintaining the strengthened grid needed to support the distributed wind power generators;
- Emissions from the additional work required by the distributors;
- Emissions from coal power stations pumping water to pumped storage that then has to be used for rapid response back-up, for extra 'spinning reserve' and for stabilising the grid because of the variable power from wind turbines;
- The hydro energy resource on mainland Australia is limited and insufficient to provide for even our peak load energy needs. Any hydro energy used as back up for wind power must be replaced with OCGT generation. In effect, any hydro energy used for back up for wind has the same emissions as OCGT running as back up for wind.

The second source for comparison is the Royal Academy of Engineering report "The Cost of Generating Electricity"[8]. We can calculate the amount of emissions avoided by wind with back up from the information provided in the report.[9]

	Generation cost (UK p/kWh)			Emissions
	Carbon tax £0 / t CO2-e	Carbon tax £30 / t CO2-e	Difference	kg CO2e / kWh
CCGT	2.2	3.4	1.2	0.400[10]
OCGT	3.2	4.8	1.6	0.533
Wind	3.7	3.7	0	0.027
back up	1.7	1.7	0	0.283[11]
Wind with back up	5.4	5.4	0	0.310
Emissions avoided				**0.090**

So, we have three values for the amount of greenhouse gas emissions avoided by wind generation per MWh.

Basis of estimate	**t CO2 avoided /MWh**
Wind with OCGT back up displacing CCGT	0.058
Wind, excluding back up (SA Wind Power Study)[12]	0.5
Wind including back up (Royal Academy of Engineering, UK)	0.09

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[8] http://www.raeng.org.uk/news/publications/list/reports/Cost_Generation_Commentary.pdf

[9] Using cost data from the Royal Academy of Engineering report (with and without a carbon tax), we can infer the emissions per kWh factor they used by taking the difference in cost per tonne CO2 and dividing it by the carbon tax cost per tonne CO2 (first two rows). Emissions for wind, back-up and wind with back-up are taken from the previous page. Emissions avoided (last row) are calculated by CCGT emissions minus emissions from wind with back-up.

[10] calculated as: Difference converted from p to £, divided by carbon tax, converted from t to kg

[11] calculated as: emissions from OCGT x cost of back-up / cost of OCGT

[12] "South Australia Wind Power Study" by Electricity Supply Industry Planning Council, March 2003.

Cost of emissions avoided per MWh

The cost of emissions avoided by wind power can be calculated from the figures in the preceding sections. The cost of emission avoided by wind is the cost of substituting wind power plus OCGT back-up for CCGT. We have three figures for the amount of emissions avoided. The higher emissions avoided (lower avoidance cost) is calculated from the results of a modelling analysis which does not include the emissions from back up. The two low figures for emissions avoided (higher avoidance cost) do include an allowance for the emissions from back up. The first is a simple analysis. The other is from a sophisticated study by the UK Royal Academy of Engineering.

Cost per MWh to substitute Wind with back-up for CCGT ($/MWh)	$67	$67	$74
Emissions avoided (t CO2-e/MWh)	0.058	0.5	0.09
Cost of emissions avoided ($t CO2-e avoided)	$1,149	$134	$830

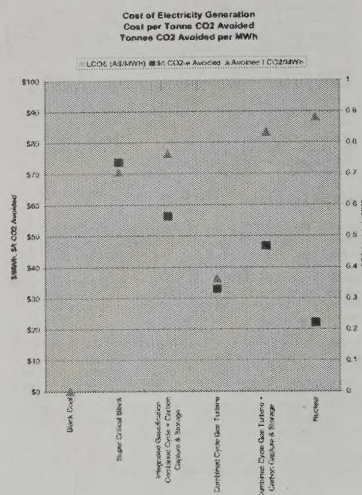
All three figures for the cost of emissions avoided by Wind power are high compared with alternatives.

Comparison with Other Options to Reduce Emissions from Electricity Generation

Figure 4 shows the cost of avoiding emission, and the amount of emissions avoided per MWh, by some new base load electricity generating technologies. Wind contributes to generating for shoulder (or non-continuous) power rather than base load so the figures are not directly comparable. But the figures do indicate that wind power is a costly way to reduce CO2 emissions (i.e., $134 to $1149 per tonne CO2-e avoided), and that the amount of emissions avoided by wind is negligible.

Nuclear power avoids the most emissions per MWh and is the least cost for doing so at about $22 per tonne of CO2 avoided (Figure 4).

Figure 4 - Projected cost of electricity, amount of emissions avoided and avoidance cost per MWh for future base load electricity generation technologies
Source: calculated from the reports by EPRI[13] and University of Sydney Integrated Sustainability Analysis[14].



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[13] http://www.pmc.gov.au/umpner/docs/commissioned/EPRI_report.pdf

[14] http://www.pmc.gov.au/umpner/docs/commissioned/ISA_report.pdf

The table below compares some technology options for reducing emissions. The technologies are ordered from highest to lowest cost of avoiding emissions (column 3).

	Emissions (t CO2-e / MWh	Emissions Avoided (t CO2-e avoided / MWh	Cost of Emissions avoided ($/t CO2-e avoided)
Wind (including back up generation) (Aus)[15]	0.519	0.058	$1149
Wind (including back up generation) (UK)	0.310	0.090	$830
'Clean Coal' (IGCC + CCS)	0.126	0.765	$56
Combined Cycle Gas Turbine + CCS	0.108	0.833	$47
Combined Cycle Gas Turbine	0.577	0.364	$33
Nuclear	0.060	0.880	$22

The table shows:

1. Wind power is the highest cost and nuclear the lowest cost for avoiding emissions (by a factor of about 50) (Column 3);
2. Wind power does not meet the Clean Energy Targets'[16]' 200 kg/MWh test (Column 1);
3. Only nuclear and the fossil fuel technologies with carbon capture and storage meet the '200 kg/MWh test' (Column 1);
4. Only nuclear and the fossil fuel technologies with carbon capture and storage can make substantial reductions in emissions - i.e., can avoid more than 750 kg/CO2-e/MWh (Column 2). To put this in perspective, 750 kg/CO2-e/MWh is about 75% of the emissions from conventional coal fired generation. Coal fired generation produces about 76% of Australia's electricity and 89% of electricity's greenhouse gas emissions.

Discussion

The results are sensitive to the input parameters (capacity factors, emissions per MWh, costs per MWh, and the cost and emissions from back-up).

The capacity factor for wind generation in NSW should be less than the 30% used in this analysis (for example Crookwell 14.7% over 5 years and Blayney 22%).

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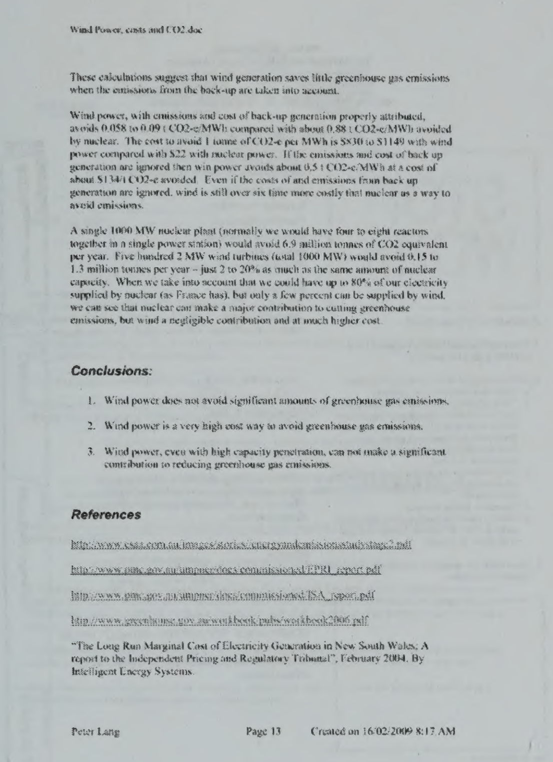
[15] For wind back up generation the figures are:

Wind (excluding back up generation) (Aus)	0.027	0.500	$134

[16] The Federal Government recently announced national Clean Energy Targets to replace the state based renewable energy and emissions reductions schemes. The new national Clean Energy Target, requires that 30,000 GWh each year must come from low emissions sources by 2020. Low emission sources are those technologies that emit less than 200 kg of greenhouse gases per MWh of electricity generated.

Comment Letter O13



Wind Power, costs and CO2.doc

These calculations suggest that wind generation saves little greenhouse gas emissions when the emissions from the back-up are taken into account.

Wind power, with emissions and cost of back-up generation properly attributed, avoids 0.058 to 0.09 t CO2-e/MWh compared with about 0.88 t CO2-e/MWh avoided by nuclear. The cost to avoid 1 tonne of CO2-e per MWh is $830 to $1149 with wind power compared with $22 with nuclear power. If the emissions and cost of back up generation are ignored then win power avoids about 0.5 t CO2-e/MWh at a cost of about $134/t CO2-e avoided. Even if the costs of and emissions from back up generation are ignored, wind is still over six time more costly that nuclear as a way to avoid emissions.

A single 1000 MW nuclear plant (normally we would have four to eight reactors together in a single power station) would avoid 6.9 million tonnes of CO2 equivalent per year. Five hundred 2 MW wind turbines (total 1000 MW) would avoid 0.15 to 1.3 million tonnes per year – just 2 to 20% as much as the same amount of nuclear capacity. When we take into account that we could have up to 80% of our electricity supplied by nuclear (as France has), but only a few percent can be supplied by wind, we can see that nuclear can make a major contribution to cutting greenhouse emissions, but wind a negligible contribution and at much higher cost.

Conclusions:

1. Wind power does not avoid significant amounts of greenhouse gas emissions.
2. Wind power is a very high cost way to avoid greenhouse gas emissions.
3. Wind power, even with high capacity penetration, can not make a significant contribution to reducing greenhouse gas emissions.

References

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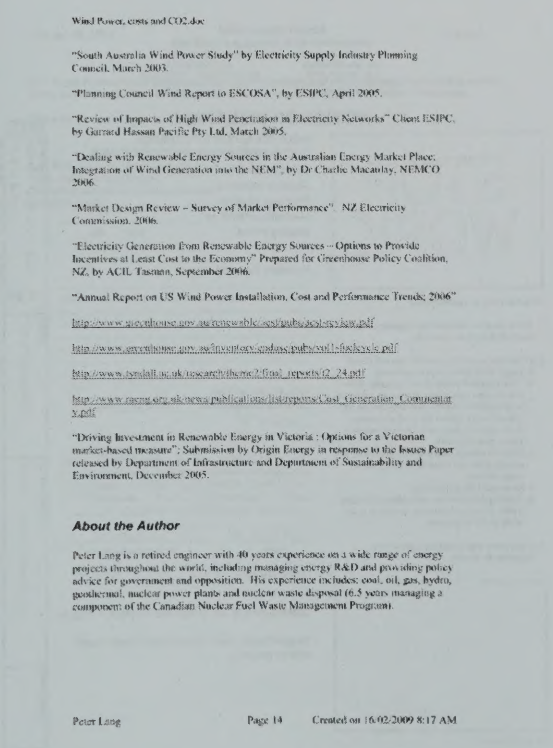

Wind Power, costs and CO2.doc

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About the Author

Peter Lang is a retired engineer with 40 years experience on a wide range of energy projects throughout the world, including managing energy R&D and providing policy advice for government and opposition. His experience includes: coal, oil, gas, hydro, geothermal, nuclear power plants and nuclear waste disposal (6.5 years managing a component of the Canadian Nuclear Fuel Waste Management Program).

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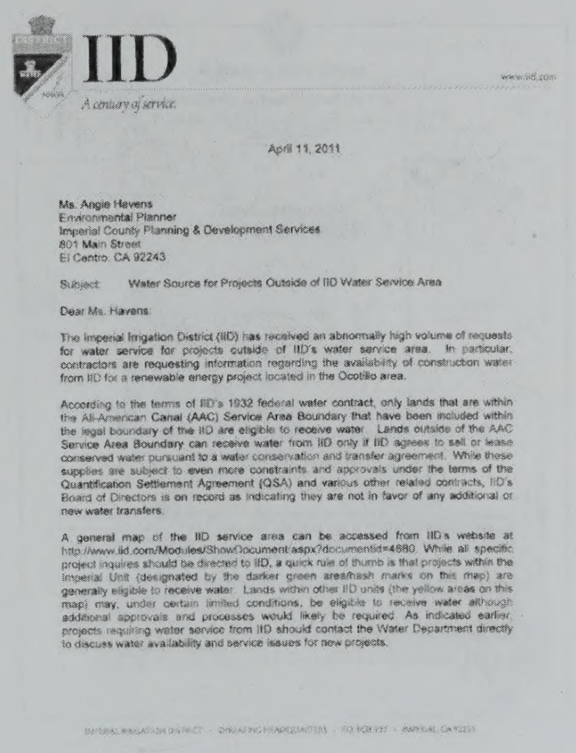


IID
A century of service.
www.iid.com

April 11, 2011

Ms. Angie Havens
Environmental Planner
Imperial County Planning & Development Services
801 Main Street
El Centro, CA 92243

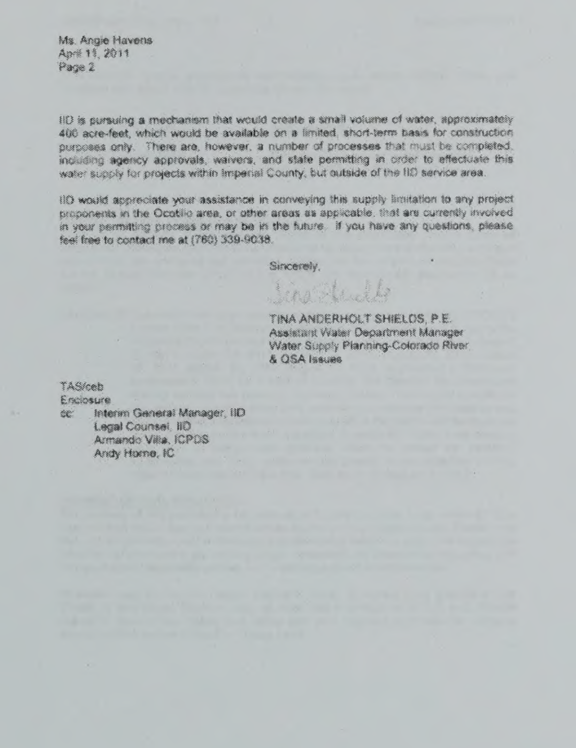
Subject: Water Source for Projects Outside of IID Water Service Area

Dear Ms. Havens:

The Imperial Irrigation District (IID) has received an abnormally high volume of requests for water service for projects outside of IID's water service area. In particular, contractors are requesting information regarding the availability of construction water from IID for a renewable energy project located in the Ocotillo area.

According to the terms of IID's 1932 federal water contract, only lands that are within the All-American Canal (AAC) Service Area Boundary that have been included within the legal boundary of the IID are eligible to receive water. Lands outside of the AAC Service Area Boundary can receive water from IID only if IID agrees to sell or lease conserved water pursuant to a water conservation and transfer agreement. While these supplies are subject to even more constraints and approvals under the terms of the Quantification Settlement Agreement (QSA) and various other related contracts, IID's Board of Directors is on record as indicating they are not in favor of any additional or new water transfers.

A general map of the IID service area can be accessed from IID's website at http://www.iid.com/Modules/ShowDocument.aspx?documentid=4680. While all specific project inquires should be directed to IID, a quick rule of thumb is that projects within the Imperial Unit (designated by the darker green area/hash marks on this map) are generally eligible to receive water. Lands within other IID units (the yellow areas on this map) may, under certain limited conditions, be eligible to receive water although additional approvals and processes would likely be required. As indicated earlier, projects requiring water service from IID should contact the Water Department directly to discuss water availability and service issues for new projects.



Ms. Angie Havens
April 11, 2011
Page 2

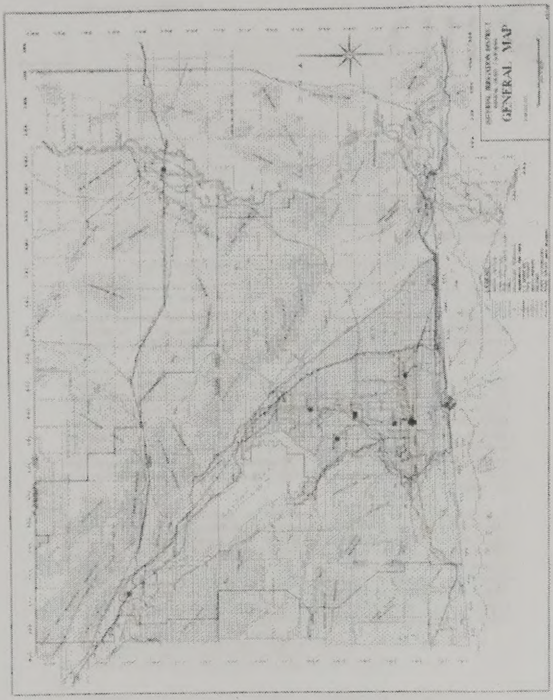
IID is pursuing a mechanism that would create a small volume of water, approximately 400 acre-feet, which would be available on a limited, short-term basis for construction purposes only. There are, however, a number of processes that must be completed, including agency approvals, waivers, and state permitting in order to effectuate this water supply for projects within Imperial County, but outside of the IID service area.

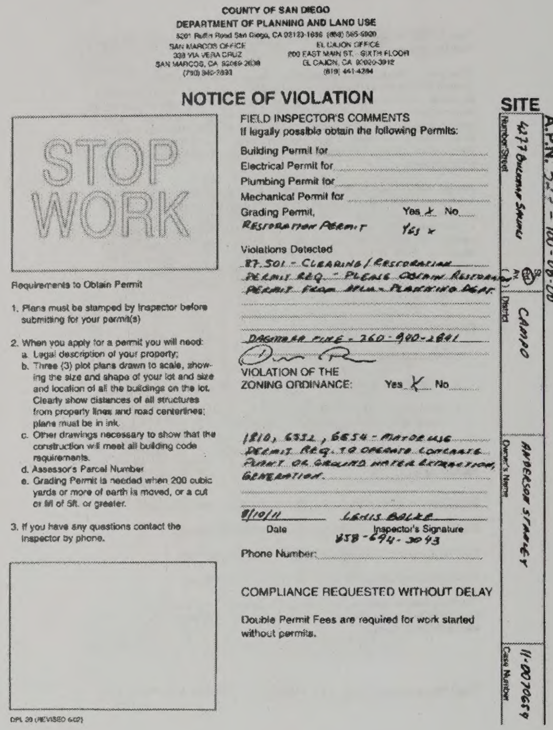
IID would appreciate your assistance in conveying this supply limitation to any project proponents in the Ocotillo area, or other areas as applicable, that are currently involved in your permitting process or may be in the future. If you have any questions, please feel free to contact me at (760) 339-9038.

Sincerely,

TINA ANDERHOLT SHIELDS, P.E.
Assistant Water Department Manager
Water Supply Planning-Colorado River
& QSA Issues

TAS/ceb
Enclosure
cc: Interim General Manager, IID
Legal Counsel, IID
Armando Villa, ICPDS
Andy Horne, IC





COUNTY OF SAN DIEGO
DEPARTMENT OF PLANNING AND LAND USE
5201 Ruffin Road San Diego, CA 92123-1666 (858) 565-5920
SAN MARCOS OFFICE
338 VIA VERA CRUZ
SAN MARCOS, CA 92069-2638
(760) 940-2833
EL CAJON OFFICE
200 EAST MAIN ST. - SIXTH FLOOR
EL CAJON, CA 92020-3912
(619) 441-4284

NOTICE OF VIOLATION

STOP WORK

Requirements to Obtain Permit

1. Plans must be stamped by Inspector before submitting for your permit(s)
2. When you apply for a permit you will need:
   - a. Legal description of your property;
   - b. Three (3) plot plans drawn to scale, showing the size and shape of your lot and size and location of all the buildings on the lot. Clearly show distances of all structures from property lines and road centerlines; plans must be in ink.
   - c. Other drawings necessary to show that the construction will meet all building code requirements.
   - d. Assessor's Parcel Number
   - e. Grading Permit is needed when 200 cubic yards or more of earth is moved, or a cut or fill of 5ft. or greater.
3. If you have any questions contact the inspector by phone.

FIELD INSPECTOR'S COMMENTS
If legally possible obtain the following Permits:

Building Permit for
Electrical Permit for
Plumbing Permit for
Mechanical Permit for
Grading Permit, Yes X No
RESTORATION PERMIT Yes X

Violations Detected
87.501 - CLEARING / RESTORATION PERMIT REQ. - PLEASE OBTAIN RESTORATION PERMIT FROM MLM - PLANNING DEPT.

DAGMARA FIKE - 260-900-2841

VIOLATION OF THE ZONING ORDINANCE: Yes X No

1810, 6332, 6654 - MAJOR USE PERMIT REQ. TO OPERATE CONCRETE PLANT OR GROUND WATER EXTRACTION, GENERATION.

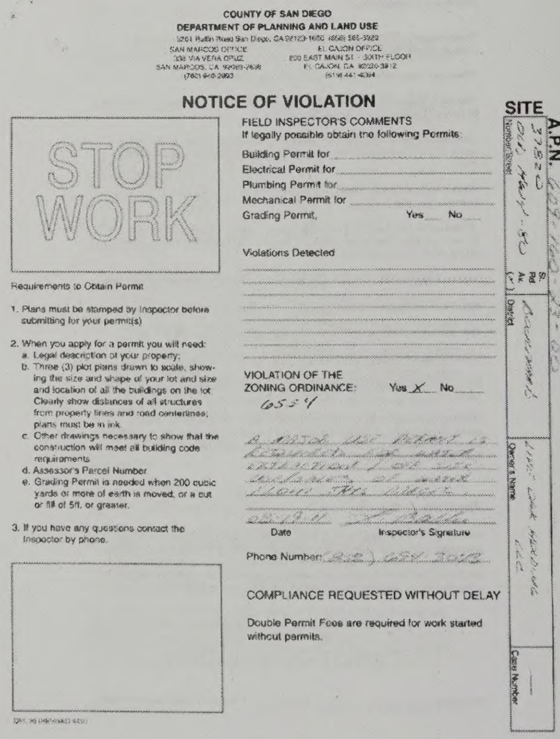
8/10/11 LEWIS BALKE
Date Inspector's Signature
858-694-3043
Phone Number:

COMPLIANCE REQUESTED WITHOUT DELAY

Double Permit Fees are required for work started without permits.

SITE
A.P.N. 527 - 100 - 08 - 00
Number/Street: 4277 BUCKMAN SPRINGS St. [✓ Rd.] Av.
District: CAMPO
Owner's Name: ANDERSON STANLEY
Case Number: 11-0070659

DPL 30 (REVISED 6/02)



COUNTY OF SAN DIEGO
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SAN MARCOS OFFICE
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(760) 940-2833
EL CAJON OFFICE
200 EAST MAIN ST. - SIXTH FLOOR
EL CAJON, CA 92020-3912
(619) 441-4284

NOTICE OF VIOLATION

STOP WORK

Requirements to Obtain Permit

1. Plans must be stamped by Inspector before submitting for your permit(s)
2. When you apply for a permit you will need:
   - a. Legal description of your property;
   - b. Three (3) plot plans drawn to scale, showing the size and shape of your lot and size and location of all the buildings on the lot. Clearly show distances of all structures from property lines and road centerlines; plans must be in ink.
   - c. Other drawings necessary to show that the construction will meet all building code requirements.
   - d. Assessor's Parcel Number
   - e. Grading Permit is needed when 200 cubic yards or more of earth is moved, or a cut or fill of 5ft. or greater.
3. If you have any questions contact the inspector by phone.

FIELD INSPECTOR'S COMMENTS
If legally possible obtain the following Permits:

Building Permit for
Electrical Permit for
Plumbing Permit for
Mechanical Permit for
Grading Permit, Yes No

Violations Detected

VIOLATION OF THE ZONING ORDINANCE: Yes X No
6554

A MAJOR USE PERMIT IS REQUIRED FOR WATER EXTRACTION [illegible] [illegible] [illegible] OF WATER FROM THIS [illegible]

[illegible] [illegible]
Date Inspector's Signature

Phone Number: [illegible]

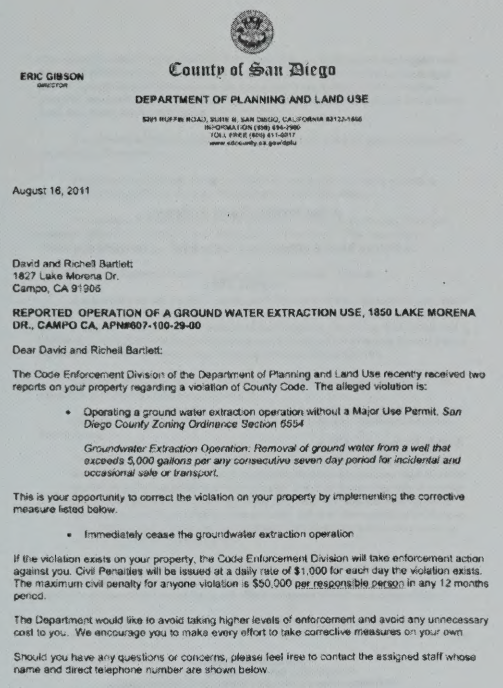
COMPLIANCE REQUESTED WITHOUT DELAY

Double Permit Fees are required for work started without permits.

SITE
A.P.N. [illegible]
Number/Street: 37820 Old Hwy 80 St. Rd. Av. (✓)
District: Boulevard
Owner's Name: Live Oak Holding LLC
Case Number: —

DPL 30 (REVISED 6/02)

Comment Letter O13



ERIC GIBSON
DIRECTOR

County of San Diego

DEPARTMENT OF PLANNING AND LAND USE

5201 RUFFIN ROAD, SUITE B, SAN DIEGO, CALIFORNIA 92123-1666
INFORMATION (858) 694-2960
TOLL FREE (800) 411-0017
www.sdcounty.ca.gov/dplu

August 16, 2011

David and Richell Bartlett
1827 Lake Morena Dr.
Campo, CA 91906

REPORTED OPERATION OF A GROUND WATER EXTRACTION USE, 1850 LAKE MORENA DR., CAMPO CA, APN#607-100-29-00

Dear David and Richell Bartlett:

The Code Enforcement Division of the Department of Planning and Land Use recently received two reports on your property regarding a violation of County Code. The alleged violation is:

- Operating a ground water extraction operation without a Major Use Permit. *San Diego County Zoning Ordinance Section 6554*

  Groundwater Extraction Operation: Removal of ground water from a well that exceeds 5,000 gallons per any consecutive seven day period for incidental and occasional sale or transport.

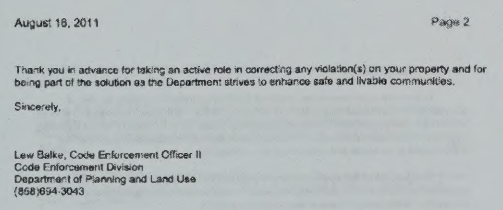
This is your opportunity to correct the violation on your property by implementing the corrective measure listed below.

- Immediately cease the groundwater extraction operation

If the violation exists on your property, the Code Enforcement Division will take enforcement action against you. Civil Penalties will be issued at a daily rate of $1,000 for each day the violation exists. The maximum civil penalty for anyone violation is $50,000 per responsible person in any 12 months period.

The Department would like to avoid taking higher levels of enforcement and avoid any unnecessary cost to you. We encourage you to make every effort to take corrective measures on your own

Should you have any questions or concerns, please feel free to contact the assigned staff whose name and direct telephone number are shown below.

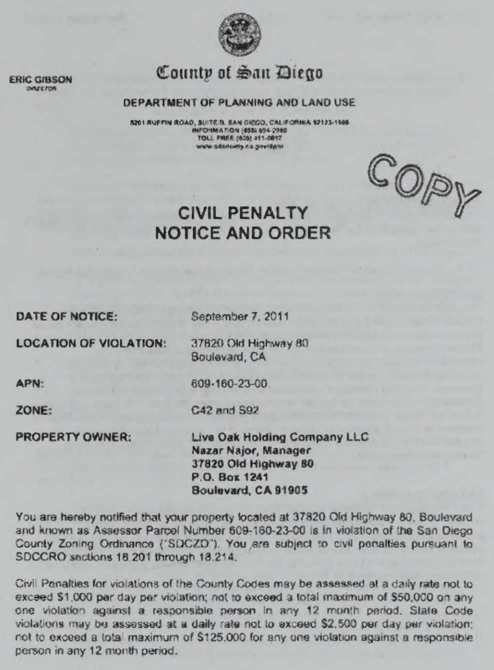


August 16, 2011 Page 2

Thank you in advance for taking an active role in correcting any violation(s) on your property and for being part of the solution as the Department strives to enhance safe and livable communities.

Sincerely,

Lew Balke, Code Enforcement Officer II
Code Enforcement Division
Department of Planning and Land Use
(858)694-3043



ERIC GIBSON
DIRECTOR

County of San Diego

DEPARTMENT OF PLANNING AND LAND USE

5201 RUFFIN ROAD, SUITE B, SAN DIEGO, CALIFORNIA 92123-1666
INFORMATION (858) 694-2960
TOLL FREE (800) 411-0017
www.sdcounty.ca.gov/dplu

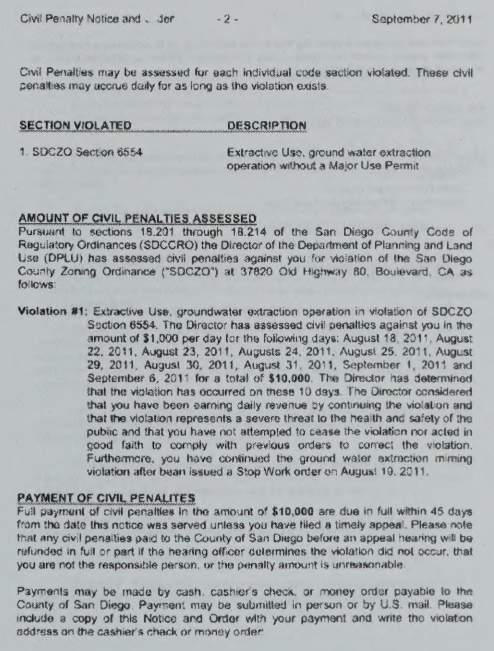
COPY

CIVIL PENALTY NOTICE AND ORDER

DATE OF NOTICE:	September 7, 2011
LOCATION OF VIOLATION:	37820 Old Highway 80 Boulevard, CA
APN:	609-160-23-00
ZONE:	C42 and S92
PROPERTY OWNER:	**Live Oak Holding Company LLC** **Nazar Najor, Manager** **37820 Old Highway 80** **P.O. Box 1241** **Boulevard, CA 91905**

You are hereby notified that your property located at 37820 Old Highway 80, Boulevard and known as Assessor Parcel Number 609-160-23-00 is in violation of the San Diego County Zoning Ordinance ("SDCZO"). You are subject to civil penalties pursuant to SDCCRO sections 18.201 through 18.214.

Civil Penalties for violations of the County Codes may be assessed at a daily rate not to exceed $1,000 per day per violation; not to exceed a total maximum of $50,000 on any one violation against a responsible person in any 12 month period. State Code violations may be assessed at a daily rate not to exceed $2,500 per day per violation; not to exceed a total maximum of $125,000 for any one violation against a responsible person in any 12 month period.



Civil Penalty Notice and Order - 2 - September 7, 2011

Civil Penalties may be assessed for each individual code section violated. These civil penalties may accrue daily for as long as the violation exists.

SECTION VIOLATED	DESCRIPTION
1. SDCZO Section 6554	Extractive Use, ground water extraction operation without a Major Use Permit

AMOUNT OF CIVIL PENALTIES ASSESSED

Pursuant to sections 18.201 through 18.214 of the San Diego County Code of Regulatory Ordinances (SDCCRO) the Director of the Department of Planning and Land Use (DPLU) has assessed civil penalties against you for violation of the San Diego County Zoning Ordinance ("SDCZO") at 37820 Old Highway 80, Boulevard, CA as follows:

Violation #1: Extractive Use, groundwater extraction operation in violation of SDCZO Section 6554. The Director has assessed civil penalties against you in the amount of $1,000 per day for the following days: August 18, 2011, August 22, 2011, August 23, 2011, Augusts 24, 2011, August 25, 2011, August 29, 2011, August 30, 2011, August 31, 2011, September 1, 2011 and September 6, 2011 for a total of **$10,000**. The Director has determined that the violation has occurred on these 10 days. The Director considered that you have been earning daily revenue by continuing the violation and that the violation represents a severe threat to the health and safety of the public and that you have not attempted to cease the violation nor acted in good faith to comply with previous orders to correct the violation. Furthermore, you have continued the ground water extraction miming violation after bean issued a Stop Work order on August 19, 2011.

PAYMENT OF CIVIL PENALITES

Full payment of civil penalties in the amount of **$10,000** are due in full within 45 days from the date this notice was served unless you have filed a timely appeal. Please note that any civil penalties paid to the County of San Diego before an appeal hearing will be refunded in full or part if the hearing officer determines the violation did not occur, that you are not the responsible person, or the penalty amount is unreasonable.

Payments may be made by cash, cashier's check, or money order payable to the County of San Diego. Payment may be submitted in person or by U.S. mail. Please include a copy of this Notice and Order with your payment and write the violation address on the cashier's check or money order.

County of San Diego
Department of Planning and Land Use
5201 Ruffin Road, Suite B
San Diego, CA 92123
Attn: Cashier

REQUIRED CORRECTIVE MEASURES
You are ordered to immediately cease the violation and complete all action necessary to resolve the violation to the satisfaction of the Department. Specifically, you must immediately:

1. Immediately cease the ground water extraction use without a Major Use Permit.

RIGHT OF APPEAL
You have the right to request a hearing to contest this Notice and Order within 14 calendar days from the day the notice was served, which is either the postmark date on the envelope or if received in person, the date you received this notice by hand delivery. Failure to request a hearing within the 14 days constitutes a waiver of any administrative remedies and you lose your rights to contest whether the violation occurred; whether you are responsible for the violation charged; the dates of the violations, including whether the violation is continuing; and whether the amount assessed is reasonable. An appeal must be made using the form, "Request for Hearing to Contest Notice and Order to Assess Civil Penalties" which is attached to this letter or available at Code Enforcement Division offices. If you request a hearing by mail, the request must be postmarked within the 14 day deadline. Untimely requests for a hearing are not accepted.

FAILURE TO COMPLY
If you fail, neglect or refuse to obey an order to pay civil penalties and make the required corrective measures detailed in this letter, the Director may issue an Administrative Enforcement Order (AEO) and use all legal means to recover the civil penalties owed including referral of the debt to the Auditor and Controller for collection, file a civil action against you, or record the AEO as a lien against the real property on which the violation is located.

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f you have any questions concerning this Notice and Order, or to schedule a compliance inspection please contact Lew Balke, Code Enforcement Officer at (858) 694-3043 or via e-mail at Lewis.balke@sdcounty.ca.gov.

Eric Gibson, Director
Department of Planning and Land Use

BY
Pari Elias, Chief
Code Enforcement Division
Department of Planning and Land Use

cc: Lew Balke, Code Enforcement Officer II
Frank Rich Lindh, Esq., CA Public Utilities Commission
Ann E. Mercer, Project Manager, U.S. Army Corps of Engineers
Eric Strom, Project Manager, U.S. Army Corps of Engineers

Attachments:
Request for Hearing to Contest Notice and Order to Assess Civil Penalties

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A Summary of new evidence:

Adverse health effects and industrial wind turbines

August 2011

Carmen M.E. Krogh, BScPharm

Brett S. Horner, BA, CMA

To whom it may concern

In previous communications, evidence has been provided regarding the risk of adverse health effects and industrial wind turbines (IWTs). Up to now, the siting of IWTs in Ontario is based on predictive computer modelling. While there is ample evidence regarding adverse health effects, the conduct of human health studies to determine regulations for setbacks and noise levels that protect health is still lacking.

The purpose of this document is to inform authorities and decision makers of new evidence, including articles published in peer reviewed scientific journals which advance knowledge on the topic of adverse health effects of IWTs.

Based on the evidence compiled in this document, no further IWT projects should be approved in proximity to humans until human health studies are conducted to determine setbacks and noise levels that will ensure the health and welfare of all exposed individuals.

Furthermore where there are reports of adverse health and/or noise complaints IWTs should be decommissioned until the human health studies have been conducted to determine regulations for setbacks and noise levels that protect health.

This summary may be used and submitted by other individuals.

No financial compensation has been requested nor received for this summary.

Denial of adverse health effects

For years now, the Canadian Wind Energy Association (CanWEA) has denied that wind turbines can cause adverse health effects. However, based on previously known and recent information, this denial is incorrect.

A 2008 CanWEA media release informs the world "Scientists conclude that there is no evidence that wind turbines have an adverse impact on human health." [1] None of references included in this CanWEA media release state "there is no evidence that wind turbines have an adverse impact on human health."

An April 2009 CanWEA fact sheet states "Findings clearly show that there is no peer-reviewed scientific evidence indicating that wind turbines have an adverse impact on human health." [2] The fact sheet contains eight references, none of which state "there is no peer-reviewed scientific evidence indicating that wind turbines have an adverse impact on human health."

A 2009 CanWEA convened literature review concludes "Sound from wind turbines does not pose a risk of hearing loss or any other adverse health effect in humans." [3] However, the contents of the literature review contradict this conclusion by acknowledging IWT noise may cause annoyance, stress and sleep disturbance and as a result people may experience adverse physiological and psychological symptoms. The literature review acknowledges possible symptoms include distraction, dizziness, eye strain, fatigue, feeling vibration, headache, insomnia, muscle spasm, nausea, nose bleeds, palpitations, pressure in the ears or head, skin burns, stress, and tension.

The above CanWEA sponsored statements which deny risk of adverse health effects are scientifically incorrect.

Assertions that IWTs do not pose a risk to human health only serve to confuse authorities and the public on the issue wind turbines and health effects.

For example, Ontario Minister of Health Matthews reportedly stated "There is no evidence, whatsoever, that there is an issue related to turbines," [4] This statement is scientifically incorrect.

July 2011 Environmental Review Tribunal (ERT) Decision, Ontario

As noted above, the CanWEA sponsored Colby et al. (2009) literature review stated "Sound from wind turbines does not pose a risk of hearing loss or any other adverse health effect in humans." [5] Three of the co-authors of this statement, Drs. Colby, Leventhall, and McCunney testified on behalf of the Respondents (Ministry of Environment, Suncor Energy Services Inc.) during an Ontarian Environmental Review Tribunal (ERT).

Evidence provided at the ERT demonstrated the above statement authored by the CanWEA sponsored panel experts is incorrect.

The July 2011 ERT decision for an IWT project in Ontario [6] confirmed IWTs can harm humans:

> "While the Appellants were not successful in their appeals, the Tribunal notes that their involvement and that of the Respondents, has served to advance the state of the debate about wind turbines and human health. This case has successfully shown that the debate should not be simplified to one about whether wind turbines can cause harm to humans. *The evidence presented to the Tribunal demonstrates that they can, if facilities are placed too close to residents. The debate has now evolved to one of degree."* (p. 207) (*Emphasis added*)

Evidence and testimony provided to the ERT by witnesses called by the Appellants served to advance understanding of IWT induced health impacts. It is now acknowledged that IWTs do pose a risk of adverse health effect in humans if they are improperly sited.

All ten of the witnesses called upon by the Appellants were qualified as expert witnesses. The expert witnesses called upon by the Appellants have been involved in original

research on the health effects of IWTs and/or have had related articles accepted in peer reviewed scientific journals.

During the ERT expert witnesses for both the Respondents and the Appellants provided evidence and/or testimony which acknowledged IWTs sound is perceived to be more annoying than transportation noise or industrial noise at comparable sound pressure levels.

Peer reviewed articles and other references acknowledge annoyance to be an adverse health effect. (Pedersen & Persson Waye, 2007 [7]; Michaud et al. 2005 [8]; Health Canada, 2005 [9], Suter, 1991 [10])

During the ERT expert witnesses for both the Respondents [11], [12], [13], [14] and the Appellants provided evidence and/or testimony which acknowledge annoyance to be a health effect.

Research confirms for chronically strong annoyance a causal chain exists between the three steps health–strong annoyance–increased morbidity [15] and must be classified as a serious health risk. [16]

During the ERT expert witnesses for both the Respondents and the Appellants provided evidence and/or testimony which acknowledged IWTs "will" cause annoyance, which can result in stress related health impacts including sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory, and panic episodes associated with sensations of internal pulsation or quivering when awake or asleep, and depression.

During the ERT witnesses for both the Respondents and/or the Appellants provided evidence and/or testimony which indicate plausible causes of these health effects include: IWT amplitude modulation, audible low frequency sound, infrasound, tonality, lack of nighttime abatement, shadow flicker, visual impact, economic impacts or a combination thereof.

It is acknowledged Ontario regulations and/or noise guidelines will not protect all individuals from these health impacts. A 2010 final draft report prepared for the Ontario Ministry of Environment (MOE) states:

> "The audible sound from wind turbines, at the levels experienced at typical receptor distances in Ontario, *is nonetheless expected to result in a non-trivial percentage of persons being highly annoyed.* As with sounds from many sources, research has shown that annoyance associated with *sound from wind turbines can be expected to contribute to stress related health impacts in some persons."* [17] (*Emphasis added*)

MOE documents obtained through a Freedom of Information request confirm current Ontario IWT guidelines will cause adverse effects. One 2010 MOE internal memorandum states:

> "It appears compliance with the minimum setbacks and the noise study approach currently being used to approve the siting of WTGs will result or likely result in adverse effects contrary to subsection 14(1) of the EPA" [18]

Another MOE reference documents Ontario families that have abandoned their homes due to sleep disturbance caused by exposure to wind farms. [19] Sleep disturbance is an adverse health effect. MOE correspondence also documents families that have moved out of their homes and have made financial settlements with the respective IWT developer. [20]

Based on original research in Ontario, and elsewhere, a peer reviewed article states:

> "It is acknowledged that IWTs, if not sited properly, can adversely affect the health of exposed individuals. In addition to physiological and psychological symptoms there are individuals reporting adverse impacts, including reduced well-being, degraded living conditions, and adverse societal and economic impacts. These adverse impacts culminate in expressions of a loss of fairness and social justice.
>
> The above impacts represent a serious degradation of health in accordance with commonly accepted definitions of health as defined by the WHO and the Ottawa Charter for Health Promotion." [21]

August 2011 peer reviewed articles published in a scientific journal

Subsequent to the July Ontario ERT decision nine peer reviewed articles have been published in a special August, 2011 edition of the scientific journal, *Bulletin of Science, Technology and Society* (*BSTS*). These articles explore health and social impacts of IWT installations. [22], [23], [24], [25], [26], [27], [28], [29], [30]

The Special Edition is entitled *Windfarms, Communities and Ecosystems*. Included in the special edition, is a commentary by the editor, Willem H. Vanderburg. [31]

The SAGE website states:

> *"The goal of the **Bulletin of Science, Technology and Society** is to provide a means of communication within as wide of a spectrum of the STS community as possible. This includes faculty and students from sciences, engineering, the humanities, and social science in the newly emerging groups on university and college campuses, and in the high school systems, all of which teach integrative STS subject matters. It also includes professionals in government, industry and universities, ranging from philosophers and historians of science to social scientists concerned with the effects of science and technology, scientists and engineers involved with the study and policy-making of their own craft, and the concerned general leader. A third category of readers represents "society": all journalists dealing with the impacts of science and technology in their respected fields, the public interest groups and the attentive public."* [32]

One article presents the result of WindVOiCe, an Ontario self reporting health survey that follows the principles of Health Canada for vigilance monitoring of pharmaceuticals and other products. [33]

Another article documents social justice impacts when people cannot obtain mitigation or resolution and in some cases, have abandoned their homes due to IWT exposure. [34]

An article authored by Dr. Bob Thorne documents his research on IWT noise and correlates this with reported IWT adverse health impacts. Based this field work Dr. Thorne concludes a sound level of LAeq 32 dB outside the residence is required to avoid serious harm to human health. [35]

Ontario MOE documents obtained from a Freedom of Information request support a 32 dBA sound limit for IWTs. Based on real world field investigations MOE field officers advised the Ministry about IWT adverse effects and stated "… the setback distances should be calculated using a sound level limit of 30 to 32 dBA at the receptor, instead of the 40 dBA sound level limit." [36]

Dr. Robert McMurtry, former Dean of Medicine, University of Western Ontario, and 2011 recipient of Member of Order of Canada, published a case definition to facilitate a clinical diagnosis regarding adverse health effects and IWTs. [37]

Other articles explore topics including how to properly interpret IWT epidemiological evidence, [38] the physics of IWT noise, [39] public health ethics, [40] potential IWT noise impacts on children, [41] and potential IWT infrasound sound impacts on the human ear. [42]

These articles are critical to anyone interested in the safe siting of IWTs. It is recommended that authorities and regulators obtain a copy of each of the nine articles.

Please use this link if you wish to access these articles http://bst.sagepub.com

Downloads of these articles can be obtained with an individual subscription for $100. This will allow you to download these and other articles from the BSTS scientific journal.

IWT low frequency noise and infrasound

In the past some commentators have stated low frequency noise from IWTs is not an issue. Other references indicate most available evidence suggests that reported IWT health effects, such as sleeplessness and headache, are related to audible low frequency noise. [43]

A June 2011 Federal Australian Senate committee investigating IWT and adverse health effects report recommended:

> "… noise standards adopted by the states and territories for the planning and operation of rural wind farms should include appropriate measures to calculate the impact of low frequency noise and vibrations indoors at impacted dwellings." [44]

A June 2011 peer reviewed article on IWT low frequency noise is available. [45]

The abstract states:

> As wind turbines get larger, worries have emerged that the turbine noise would move down in frequency and that the low-frequency noise would cause annoyance for the neighbors. The noise emission from 48 wind turbines with nominal electric power up to 3.6 MW is analyzed and discussed. The relative amount of low-frequency noise is higher for large turbines (2.3–3.6 MW) than for small turbines ([1] 2 MW), and the difference is statistically significant. The difference can also be expressed as a downward shift of the spectrum of approximately one-third of an octave. A further shift of similar size is suggested for future turbines in the 10-MW range. Due to the air absorption, the higher low-frequency content becomes even more pronounced, when sound pressure levels in relevant neighbor distances are considered. Even when A-weighted levels are considered, a substantial part of the noise is at low frequencies, and for several of the investigated large turbines, the one-third-octave band with the highest level is at or below 250 Hz. It is thus beyond any doubt that the low-frequency part of the spectrum plays an important role in the noise at the neighbors."

Annoyance from audible low frequency noise is acknowledged to be more severe in general. Low frequency noise does not need to be considered loud for it to cause annoyance and irritation. [46] Low frequency noise causes immense suffering to those who are unfortunate to be sensitive to it [47] and chronic psychophysiological damage may result from long-term exposure to low-level low frequency noise. [48] Some symptoms associated with exposure to low frequency noise include annoyance, stress, sleep disturbance, headaches, difficulty concentrating, irritability, fatigue, dizziness or vertigo, tinnitus, anxiety, heart ailments and palpitation. [49], [50], [51]

Møller and Pedersen, (2011) indicate IWT low frequency noise is more of an issue for large turbines of 2.3 MW and up. [52] However low frequency noise from smaller turbines (ie 1.5MW) can also cause adverse health effects. Freedom of Information documents

obtained from the MOE document low frequency noise issues from smaller IWTs (i.e., 1.5 MW) at Ontario wind farms. The MOE documents how IWT low frequency noise caused a home to be "uninhabitable" resulting in family members abandoning trying to sleep there. [53] For further discussion see Krogh (2011) [54] and Thorne (2011). [55]

Research on the potential impacts of IWT infrasound has been published in two peer reviewed scientific journals (Salt and Hullar, 2010 [56], Salt and Kaltenbach, 2011 [57]). These articles conclude that it is scientifically possible that infrasound from IWTs could affect people living nearby and more research is needed.

Wind Turbines Noise, Fourth International Meeting

During the Rome Conference Fourth International Meeting on Wind Turbine Noise Rome Italy 12-14 April 2011 there were a number of presentations documenting IWT noise issues.

The Wind Turbine Noise (2011) post-conference report states:

> "The main effect of daytime wind turbine noise is annoyance. The night time effect is sleep disturbance. These may lead to stress related illness in some people. Work is required in understanding why low levels of wind turbine noise may produce affects which are greater than might be expected from their levels." [58]

A number of conference papers addressed human health impacts of IWTs. For example one research team conducted a study which demonstrated those living in the immediate vicinity of IWTs scored worse than a matched control group in terms of physical and environmental health related quality of life (HRQOL). [59]

The Ontario ERT expert witnesses for both the Respondents and the Appellants provided evidence and/or testimony which acknowledged IWT amplitude modulation and/or audible low frequency noise are probable causes of IWT adverse health effects.

Research related to low frequency noise "…confirms the importance of fluctuations as a contributor to annoyance and the limitation of those assessment methods, which do not include fluctuations in the assessment." [60]

In addition, the World Health Organization states:

> "Noise measures based solely on LAeq values do not adequately characterize most noise environments and do not adequately assess the health impacts of noise on human well-being. It is also important to measure the maximum noise level and the number of noise events when deriving guideline values. If the noise includes a large proportion of low-frequency components, values even lower than the guideline values will be needed, because low-frequency components in noise may increase the adverse

> effects considerably. When prominent low-frequency components are present, measures based on A-weighting are inappropriate." [61]

Consultants for the Ontario MOE, Aercoustics, submitted a paper at the Fourth International Meeting on Wind Turbine Noise which states:

> "Sound emissions from operating wind farms frequently give rise to noise complaints. Most compliance-based noise audits measure hourly "A"-weighted Leq, thereby removing the low-frequency contents of the wind turbine sound. The metric is also insensitive to amplitude modulation and is unsatisfactory when sensitive receptor are annoyed by the low frequency sound and amplitude modulation." [62]

Current Ontario guidelines are based on the A-Weighted Leq metric and hence must be considered unsatisfactory to protect individuals from the health impacts of IWT amplitude modulation and/or low frequency noise.

The need for research

The authors of a Canadian Wind Energy Association sponsored report state they do not "advocate for funding further studies." [63]

The April 2011 Wind Turbine Noise post–conference report states:

> "Work is required in understanding why low levels of wind turbine noise may produce affects which are greater than might be expected from their levels." [64]

A June 2011 Australian Senate committee investigating IWT and adverse health effects report recommended:

> "… the Commonwealth Government initiate as a matter of priority thorough, adequately resourced epidemiological and laboratory studies of the possible effects of wind farms on human health. This research must engage across industry and community, and include an advisory process representing the range of interests and concerns." [65]

The July 2011 Ontario ERT decision also acknowledged that more research is needed. [66]

> "Just because the Appellants have not succeeded in their appeals, that is no excuse to close the book on further research. On the contrary, further research should help resolve some of the significant questions that the Appellants have raised." (p. 207)

International experts who have conducted original research and/or published peer reviewed articles in scientific journals confirm that research is required. [67], [68], [69], [70], [71], [72], [73], [74], [75], [76]

Inappropriate use of literature reviews

Literature reviews can be useful tools for summarizing existing literature related to a particular topic. In order to be considered reliable a literature review must be complete, accurate, and objective.

In recent years a number of literature reviews have been produced which purport to explore the health effect of IWTs. Some literature reviews which have been relied upon to deny IWTs can adversely affect the health of humans. These literature reviews include Chatham-Kent Public Health Unit, (2008), [77] Colby et al, (2009), [78] Ontario Chief Medical Officer of Health, (2010), [79] and the National Health and Medical Research Council (Australia) (2010). [80] None of these literature reviews have been published in a peer reviewed scientific journal.

Reliance on these literature reviews is inappropriate as they contain errors of omission and/or commission and are neither convincing nor authoritative. Many of the conclusions are incomplete, inaccurate, lack objectivity and consequently only serve to confuse the issue of IWT health effects.

For example, these literature reviews limit their discussion to direct effects using qualifiers such as "direct physiopathological effects" or "direct causal links". Failure to carefully evaluate the indirect causal pathways and the psychological harm of IWT exposure represent errors of omission. Annoyance, sleep disturbance, cognitive and emotional response, and stress are health effects that occur through the indirect pathway. [81] The health outcomes associated with the indirect pathway are significant:

> "Physiological experiments on humans have shown that noise of a moderate level acts via an indirect pathway and has health outcomes similar to those caused by high noise exposures on the direct pathway. The indirect pathway starts with noise-induced disturbances of activities such as communication or sleep." [82]

The Ontario Environmental Review Tribunal expressed concern that the Director for the MOE relied on references which did not address the indirect pathway. [83]

As a consequence of their weaknesses some literature reviews have been criticized for their poor quality.

In March 2011, the Chief Executive Officer of National Health and Medical Research Council stated regarding their July 2010 literature review:

> "We regard this as a work in progress. We certainly do not believe that this question has been settled. That is why we are keeping it under constant review. That is why we said in our review that we believe authorities must take a precautionary approach to this." [84]

Chatham-Kent Public Health Unit (2008), [85] Colby et al, December 2009, [86] Ontario Chief Medical Officer of Health (2010), [87] share many of the same weaknesses as National Health and Medical Research Council (2010). [88] These literature reviews cannot be relied for Renewable Energy Applications and/or Renewable Energy Approvals to support the contention there is no evidence that IWTs can cause adverse health effects. For detailed analysis of some of these literature reviews visit www.windvigilance.com

Conclusion

Based on the best available evidence the following conclusions can be made

1. The Canadian Wind Energy Association sponsored statements that IWTs do not pose a risk of adverse health effects in humans are scientifically incorrect.
2. Experts who have conducted original research and/or published peer reviewed articles in scientific journals confirm IWTs can harm human health if they not sited properly.
3. Acknowledged adverse health effects include: annoyance, stress, sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory, and panic episodes associated with sensations of internal pulsation or quivering when awake or asleep. Other adverse impacts include reduced well-being, degraded living conditions, and adverse societal and economic impacts. These adverse impacts culminate in expressions of a loss of fairness and social justice.
4. The above impacts in conclusion 3 represent a serious degradation of health in accordance with commonly accepted definitions of health as defined by the WHO and the Ottawa Charter for Health Promotion.
5. It is expected that at typical setbacks and with the noise study approach currently being used in Ontario to approve the siting of IWTs, a non trivial percentage of exposed individuals will experience serious degradation of health.

6. Harm to human health can be avoided with science based regulations based on research conducted on human response to IWT exposure.
7. Experts who have conducted original research and/or published peer reviewed articles in scientific journals confirm that research is required to establish scientifically based IWT regulations to protect human health.
8. Until scientifically based research has been conducted IWTs should not sited in proximity to human habitation.

Respectfully submitted,

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[12] Reference submitted by Dr. Leventhall, General Purpose Standing Committee No. 5 Rural wind farms Ordered to be printed 16 December 2009 according to Standing Order 231

[13] Transcript of Dr. C. Ollson, Mar, 22, 2011, p. 118, l. 4 to l. 21, http://www.ert.gov.on.ca/english/decisions/index.htm

[14] Supplementary Witness Statement of William David Colby, MSc, MD, FRCP(C), p. 3, para. 1

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[19] Reference FOI, MOE Internal Correspondence, May 1, 2009

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SDG&E
A Sempra Energy utility®

Edalia Olivo-Gomez
Environmental Specialist
8315 Century Park Court
CP21E
San Diego, CA 92123
(T) 858-637-3728
(F) 858-637-3700

October 5, 2011

Mr. Cedric Perry, Project Manager
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov

Subject: Ocotillo Wind Energy Facility Draft Plan Amendment and Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR)

Mr. Perry:

San Diego Gas & Electric Company (SDG&E) appreciates the opportunity to provide comments on the above-referenced Draft EIS/EIR. SDG&E also appreciates the early and on-going coordination efforts by the Bureau of Land Management (BLM), the County of Imperial (County), and the applicant for the Ocotillo Wind Energy Facility (OWEF) to ensure that the Draft EIS/EIR considers the potential environmental impacts of the SDG&E interconnection transmission infrastructure proposed for the OWEF, specifically, the Utility Switchyard and Sunrise Powerlink [SPL] Loop-in. The Utility Switchyard and SPL Loop-in may or may not be constructed by SDG&E but will be owned and operated by SDG&E. **O14-01**

California Public Utilities Commission (CPUC) General Order No.131-D (GO 131-D) governs planning and construction of electric transmission facilities by public utilities. GO-131-D Section III.B.1.f addresses power lines or substations to be relocated or constructed which have undergone environmental review pursuant to CEQA as part of a larger project, and for which the final CEQA document finds no significant unavoidable environmental impacts caused by the proposed line or substation. SDG&E requests that the Final EIR/EIS expressly confirm that no significant unavoidable environmental impacts will be caused by the construction of the Utility Switchyard and SPL Loop-in, such that GO 131-D Section III.B.1.f applies. **O14-02**

SDG&E has been coordinating with the applicant on the development of the Project and will continue to do so. Specifically, SDG&E will continue to provide updated scope of work details during the on-going final design for the Utility Switchyard and SPL Loop-in. This scope of work includes standard Best Management Practices (BMPs) that SDG&E would implement to avoid or minimize impacts if SDG&E constructs these facilities. It is SDG&E's understanding that Ocotillo Express is responsible for compliance with the mitigation measures ultimately adopted for the OWEF (including implementation of various plans identified in the EIR/EIS), and that SDG&E must construct the facilities in accordance with BMPs. **O14-03**

SDG&E appreciates BLM and the County's review of the potential environmental impacts of the Utility Switchyard and SPL Loop-in and look forward to receiving the Final EIS/EIR. Should you have any questions, please do not hesitate to contact me at (858) 637-3728 or the Project Manager, Alan Dusi at (858) 636-5787.

Sincerely,

Edalia Olivo-Gomez

Edalia Olivo-Gomez

Cc: Nicholas Sher, California Public Utilities Commission (CPUC)
Mary Jo Borak, CPUC
Linda Wrazen, SDG&E
Allen Trial, SDG&E
Estela de Llanos, SDG&E
Alan Dusi, SDG&E

P1_Megan Ahn.txt

From: Megan <megan@adirectsd.com>
Sent: Wednesday, September 28, 2011 11:19 AM
To: Perry, Cedric C
Subject: Anza-Borrego Desert State Park

Categories: Ocotillo Exp.

Mr. Cedric Perry,

The NEPA Document does not include an alternative for production of renewable energy at point of use in cities and thus the Draft EIR/EIS is incomplete.
Please adopt the “no project” alternative and protect this important desert habitat from devastation by private industry for private profit!

IT'S MORE THAN THE PARK VIEWSHED THAT IS THREATENED
By the Ocotillo Express Wind Turbine Project

Impacts to Natural Resources of Anza-Borrego Desert State Park (ABDSP):
1. Disruption of wildlife corridors for desert bighorn sheep.
2. Adverse effects to golden eagles due to the birds striking the turbines.
3. Adverse impacts to burrowing owls, long-eared owls, Vaux's swift, peregrine falcons, flat-tailed horned lizards, barefoot geckos, Red diamond rattlesnakes, American badgers, and several listed plant species.
4. Could cause significant deaths of bats due to the drop in air pressure causing internal hemorrhaging in the lungs as well as deaths from direct strikes.
5. Unavoidable impact to plants during construction and the introduction of invasive plant species.
6. Permanent scarring to the landscape leaving an “industrial” look to the area.

P1-01

Impacts to Cultural Resources of ABDSP:
1. Visual impacts to the newly designated Cultural Preserve at Piedras Grandes, just west of Ocotillo and its “sacred site.”
2. No adequate accounting for impacts to the multiple cultural resources of the area when viewed as a cultural landscape.
3. Cultural Studies not completed prior to assessing impacts.

P2-02

Other Potential Impacts
1. Substantial increase in noise levels from the operation of the turbines, especially at night in surrounding areas.
2. Impacts to air quality from truck traffic and from concrete batch plants.
3. Increased risk of wildfire hazards.
4. Loss of soil's ability to absorb carbon from scraping.
5. Degradation to the recreational and natural experience of ABDSP by the sight of the turbines and associated facilities.
6. Loss of dark night skies.
7. Degradation of wilderness character of the several BLM wildernesses surrounding the proposed project.

P2-03

Respectfully,
Megan Ahn

Megan Ahn, President
Accountants Direct, LLC
5665 Oberlin Drive, Suite 100
San Diego, Ca. 92121
(858) 453-7100

Megan@Adirectsd.com
www.adirectsd.com

Perry, Cedric C

From:	mj <worldwalkabout7@yahoo.com>
Sent:	Wednesday, September 28, 2011 5:18 PM
To:	Perry, Cedric C
Subject:	OPPOSED to express wind turbine project
Categories:	Ocotillo Exp.

don't even think about it in the beautiful desert near ocotillo wells! P2-01

Marijo Ahnger
4138 Fanuel
SD, CA 92109

Perry, Cedric C

From: Andersen <jaa64@roadrunner.com>
Sent: Thursday, September 29, 2011 1:09 PM
To: Perry, Cedric C
Subject: Ocotillo Wind Energy Facility

Categories: Ocotillo Exp.

Dear Cedric Perry,

The NEPA (Environmental Protection Agency) Document does not include an alternative for production of renewable energy at point of use in cities and thus the Draft EIR/EIS is incomplete. **P3-01**

Please adopt the "no project" alternative and protect this important desert habitat from devastation by private industry for private profit! **P3-02**

The draft EIS (Environmental Impact Study) does not meet NEPA requirements because it lacks a full range of alternatives, namely, the alternative of producing renewable energy on rooftops in the cities where the energy is used. The BLM (Bureau of Land Management) should adopt a "no-project" alternative. The BLM is mandated to consider viable alternatives that could meet the "need" for the project that lie outside of lands within their jurisdiction. **P3-03**

This project is not needed. Local rooftop and local distributed renewable energy generation could power the 140,000 homes that this project is slated to power. Adopt the no-project alternative and protect 12,000 acres of intact desert habitat from destruction for private profit on a project that will be de-commissioned in 30 years! If this project goes through, there will be irreparable damage to the landscape. **P3-04**

Thank you,

John and Karen Andersen

Perry, Cedric C

From: Cynthia Anderson <cynthialouiseanderson@gmail.com>
Sent: Thursday, September 29, 2011 6:48 AM
To: Perry, Cedric C
Subject: opposition to proposed Ocotillo Wind Energy Facility

Categories: Ocotillo Exp.

Dear Cedric Perry:
My husband and I are long-time lovers of Borrego Springs and Anza-Borrego State Park. We visit the area several times a year for activities such as outdoor photography, nature walks, and birding. Borrego is the place we go for rest and relaxation in a pristine desert habitat.

We are dismayed to learn that the beautiful, unspoiled desert that means so much to us is under threat by the proposed Ocotillo Wind Energy Facility. The impacts on the area's viewshed, soils, and plant and bird life would be especially significant. **P4-01**

It is also extremely disturbing to realize that the dark skies for which the Borrego region is famous would be permanently impacted by this project. The impacts of noise and fire danger are also of grave concern. **P4-02**

We are aware that the Draft EIR/EIS is incomplete and does not meet NEPA requirements because it *lacks a full range of alternatives*, namely, the alternative of producing renewable energy on rooftops in the cities where the energy is used. **This project is simply not needed.** Local rooftop and local distributed renewable energy generation could power the 140,000 homes that this project is slated to power. **P4-03**

We urge the BLM to adopt the no-project alternative and protect 12,000 acres of intact desert habitat from destruction for private profit on a project that will be de-commissioned in just 30 years. We need long-term solutions to California's energy needs, and this project is not one of them. **P4-04**

If this project were built, the reasons why we visit Anza-Borrego would be severely compromised. It is our belief that if the BLM does not kill this wind turbine project, the BLM will literally be killing the town of Borrego Springs—a town that bases its entire existence on the value of its pristine environment and desert tourism. **P4-05**

Sincerely,

Cynthia Anderson and Bill Dahl
5524 Grand Ave.
Yucca Valley, CA 92284

Comment Letter P5

Perry, Cedric C

From: Carl Atwood <catwood@san.rr.com>
Sent: Thursday, September 29, 2011 6:53 AM
To: Perry, Cedric C
Subject: FW: Wind Energy Farm Threatens Anza-Borrego

Categories: Ocotillo Exp.

Dear Cedric,

I support the Ocotillo Wind Energy Facility. This country needs to develop more alternate energy sources. In addition, I favor the construction project as a means to help folks with employment. I am an avid user of the local park system, have been for over 20 years. I know the area well and it is my opinion there would be no impact to the area nor would there be any long term effects. The energy is needed....PERIOD. **P5-01**

You have my support.

Carl Atwood

From: BOUNCE_1869_24363_600@renetmailb03.blackbaudhost.com [mailto:BOUNCE_1869_24363_600@renetmailb03.blackbaudhost.com] **On Behalf Of** info@theabf.org
Sent: Wednesday, September 28, 2011 10:16 PM
To: catwood@san.rr.com
Subject: Wind Energy Farm Threatens Anza-Borrego -- Help Needed!

September 28, 2011

Dear Carl

We are writing to you because we need your immediate help – before an October 6, 2011, deadline. We are askin to send a letter regarding the proposed Ocotillo Wind Energy Facility to:

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov

With a FAX copy to the State Clearinghouse: 916-323-3018

The proposed Ocotillo Wind Energy Facility consists of the construction, operation, and maintenance o wind turbines and associated facilities to generate up to 465 MW of electrical energy directly adjacent Anza-Borrego Desert State Park, within the vicinity of the community of Ocotillo. A proposed total of 1 wind turbines, which would power up to 140,000 homes—each up to 425 feet tall—and up to 42 miles access roads would be located on 12,436 acres. The project would be located contiguous with the southwestern border of ABDSP, straddling Highway S-2.

Please read below to view the visual impact on the Park and to see a list of all other impacts to the Park. This is "Sunrise Powerlink" all over again with many of the same impacts.

STOP THIS FROM HAPPENING!

Anza-Borrego Desert State Park Needs Your Help NOW

See Below for What YOU Can Do—Act by 10-6-11

View Toward Ocotillo from Red Hill in Anza-Borrego Desert State Park

View from
Access Roa
Mortero Pal
Anza-Borre
Desert Stat
Park

From the Anza-Borrego Foundation—Chuck Bennett, President, 9-27-11

IT'S MORE THAN THE PARK VIEWSHED THAT IS THREATENED

By the Ocotillo Express Wind Turbine Project

Impacts to Natural Resources of Anza-Borrego Desert State Park (ABDSP):

1. Disruption of wildlife corridors for desert bighorn sheep.
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3. Adverse impacts to burrowing owls, long-eared owls, Vaux's swift, peregrine falcons, flat-tailed horned lizards, barefoot geckos, Red diamond rattlesnakes, American badgers, and several listed plant species.
4. Could cause significant deaths of bats due to the drop in air pressure causing internal hemorrhaging in the lung well as deaths from direct strikes.
5. Unavoidable impact to plants during construction and the introduction of invasive plant species.
6. Permanent scarring to the landscape leaving an "industrial" look to the area.

Impacts to Cultural Resources of ABDSP:

1. Visual impacts to the newly designated Cultural Preserve at Piedras Grandes, just west of Ocotillo and its "sacre site."
2. No adequate accounting for impacts to the multiple cultural resources of the area when viewed as a cultural landscape.
3. Cultural Studies not completed prior to assessing impacts.

Other Potential Impacts

1. Substantial increase in noise levels from the operation of the turbines, especially at night in surrounding areas.
2. Impacts to air quality from truck traffic and from concrete batch plants.
3. Increased risk of wildfire hazards.
4. Loss of soil's ability to absorb carbon from scraping.
5. Degradation to the recreational and natural experience of ABDSP by the sight of the turbines and associated fa
6. Loss of dark night skies.
7. Degradation of wilderness character of the several BLM wildernesses surrounding the proposed project.

The NEPA (Environmental Protection Agency) Document does not include an alternative for productio renewable energy at point of use in cities and thus the Draft EIR/EIS is incomplete.

Please adopt the "no project" alternative and protect this important desert habitat from devastation b private industry for private profit!

Letters are extremely important RIGHT NOW. Please personalize your letter, adding your own experiences of the and what the loss of this area would mean to you personally.

The draft EIS (Environmental Impact Study) does not meet NEPA requirements because it *lacks a full range of alternatives*, namely, the alternative of producing renewable energy on rooftops in the cities where the energy is The BLM (Bureau of Land Management) should adopt a "no-project" alternative. The BLM is mandated to consider alternatives that could meet the "need" for the project that lie outside of lands within their jurisdiction.

This project is not needed. Local rooftop and local distributed renewable energy generation could power the 14 homes that this project is slated to power. **Adopt the no-project alternative and protect 12,000 acres of int desert habitat from destruction for private profit on a project that will be de-commissioned in 30 year** this project goes through, there will be irreparable damage to the landscape.

With GREAT appreciation for your support at this crucial time,

Sincerely,

Chuck Bennett, President
Ralph Singer, Vice-President Environmental Affairs
Diana Lindsay, Trustee
ANZA-BORREGO FOUNDATION
P.O. Box 2001
Borrego Springs, CA 92004
760-767-0446

info@theabf.org

www.theabf.org

About Anza-Borrego Foundation
Founded in 1967, Anza-Borrego Foundation is a nonprofit educational organization, land conservancy, and the sol cooperating association of Anza-Borrego Desert State Park®. ABF's mission is to protect and preserve the natural landscapes, wildlife habitat, and cultural heritage of Anza-Borrego Desert State Park® for the benefit and enjoym present and future generations. Anza-Borrego Foundation's Institute provides classes to more than 3,000 adults a

children each year, covering topics such as botany, astronomy, photography, paleontology, native cultures, desert wildlife, and more. Visit www.theabf.org to learn more.

Click here if you do not want to receive further emails.

STEPHANIE AUSTIN
448 N. GREENHOUSE WAY
PALM SPRINGS, CA 92262

PHONE/FAX (760) 327-7215
email – saustin2@dc.rr.com

September 29, 2011

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calley San Juan de Los Lagos
Moreno Valley, CA 92553

Subject: Ocotillo Wind Energy Facility

Dear Mr. Perry -

I'm counting on the BLM to protect Anza Borrego Desert State Park (ABDSP) from the ill-proposed Ocotillo Wind Energy Facility, which will wreck 12,000 acres of desert habitat for a private profit endeavor that will be useless in 30 years.

The draft EIR is incomplete and inadequate. It does not list a full range of alternatives. The impacts of this wind project are numerous and unavoidable. Unavoidable impacts (such as damage to wildlife, nesting eagles, noise, loss of dark night skies) must be listed. Alternatives must be shown, and they are not! Why is the alternative of local rooftop and locally distributed renewable energy not shown?

Anza Borrego is a natural and wonderful place, where we can get lost and find ourselves again. And its non-profit educational organization is the best there is. It is not acceptable to bombard Anza Borrego with a short-sighted, unnecessary project like a wind turbine farm.

Mr Perry, please do the right thing and put your weight behind adopting the NO PROJECT alternative.

Thank you.

Stephanie Austin

STEPHANIE AUSTIN
448 N. GREENHOUSE WAY
PALM SPRINGS, CA 92262

PHONE/FAX (760) 327-7215
email – saustin2@dc.rr.com

September 29, 2011

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calley San Juan de Los Lagos
Moreno Valley, CA 92553

Subject: Ocotillo Wind Energy Facility

Dear Mr. Perry -

I'm counting on the BLM to protect Anza Borrego Desert State Park (ABDSP) from the ill-proposed Ocotillo Wind Energy Facility, which will wreck 12,000 acres of desert habitat for a private profit endeavor that will be useless in 30 years. **P6-01**

The draft EIR is incomplete and inadequate. It does not list a full range of alternatives. The impacts of this wind project are numerous and unavoidable. Unavoidable impacts (such as damage to wildlife, nesting eagles, noise, loss of dark night skies) must be listed. Alternatives must be shown, and they are not! Why is the alternative of local rooftop and locally distributed renewable energy not shown? **P6-02**

Anza Borrego is a natural and wonderful place, where we can get lost and find ourselves again. And its non-profit educational organization is the best there is. It is not acceptable to bombard Anza Borrego with a short-sighted, unnecessary project like a wind turbine farm. **P6-03**

Mr Perry, please do the right thing and put your weight behind adopting the NO PROJECT alternative. **P6-04**

Thank you.

Stephanie Austin

Comment Letter P7

Perry, Cedric C

From: Vikki Bay <vbay@bhplaw.com>
Sent: Thursday, September 29, 2011 2:19 PM
To: Perry, Cedric C
Subject: Please stop the building of wind turbines in Anza Borrego

Categories: Ocotillo Exp.

We spend every Spring in Anza Borrego for two weeks. We love it's quietude and its many varied birds and critters. The impact of wind turbines is very disheartening as it will decimate many species currently living there. They can not be replaced once the turbines are installed and operational. Please, please re-think this and come up with a better alternative. The wildlife and I thank you in advance. **P7-01**

Among the many issues are the following

1. Disruption of wildlife corridors for desert bighorn sheep.
2. Adverse effects to golden eagles due to the birds striking the turbines.
3. Adverse impacts to burrowing owls, long-eared owls, Vaux's swift, peregrine falcons, flat-tailed horned lizards, barefoot geckos, Red diamond rattlesnakes, American badgers, and several listed plant species.
4. Could cause significant deaths of bats due to the drop in air pressure causing internal hemorrhaging in the lungs as well as deaths from direct strikes.
5. Unavoidable impact to plants during construction and the introduction of invasive plant species.
6. Permanent scarring to the landscape leaving an "industrial" look to the area.

P7-02

And what about the Cultural Resources in the Park

1. Visual impacts to the newly designated Cultural Preserve at Piedras Grandes, just west of Ocotillo and its "sacred site."
2. No adequate accounting for impacts to the multiple cultural resources of the area when viewed as a cultural landscape.
3. Cultural Studies not completed prior to assessing impacts.

P7-03

Other Potential Impacts

1. Substantial increase in noise levels from the operation of the turbines, especially at night in surrounding areas.
2. Impacts to air quality from truck traffic and from concrete batch plants.
3. Increased risk of wildfire hazards.
4. Loss of soil's ability to absorb carbon from scraping.
5. Degradation to the recreational and natural experience of ABDSP by the sight of the turbines and associated facilities.
6. Loss of dark night skies.
7. Degradation of wilderness character of the several BLM wildernesses surrounding the proposed project.

P7-04

The NEPA (Environmental Protection Agency) Document does not include an alternative for production of renewable energy at point of use in cities and thus the Draft EIR/EIS is incomplete.

The draft EIS (Environmental Impact Study) does not meet NEPA requirements because it *lacks a full range of alternatives*, namely, the alternative of producing renewable energy on rooftops in the cities where the energy is used. The BLM (Bureau of Land Management) should adopt a "no-project" alternative. The BLM is mandated to consider viable alternatives that could meet the "need" for the project that lie outside of lands within their jurisdiction. **P7-05**

This project is not needed. Local rooftop and local distributed renewable energy generation could power the 140,000 homes that this project is slated to power. **Adopt the no-project alternative and protect 12,000 acres of intact desert habitat from destruction for private profit on a project that will be de-commissioned in 30 years!** If this project goes through, there will be irreparable damage to the landscape. Leave the park a Park!

Vikki V. Bay
Brydon Hugo & Parker
135 Main Street, 20th Floor
San Francisco, CA 94105
T: (415) 808-0300
F: (415) 808-0333
Direct: (415) 808-0394
E: vbay@bhplaw.com

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Perry, Cedric C

From:	Wayne and Linda Bosshart <wmboss@comcast.net>
Sent:	Saturday, October 01, 2011 12:18 PM
To:	Perry, Cedric C
Subject:	Ocotillo Wind Energy Facility
Categories:	Ocotillo Exp.

Dear Mr. Perry,

I am an annual visitor to the Anza Borrego Desert. I am not a CA resident, but would like to ask that you adopt a "no project" alternative for the wind energy facility. There are alternative ways to power homes. Solar panels on the roofs of homes and businesses is one of those options that should be suggested. **P8-01**

I visit the desert to see and participate in the annual Swainson's Hawk migration and count in Borrego Springs. I also walk the desert while I am there looking for the beautiful desert blooms, other birds, and wildlife.

Wind turbines have proven to be a hazard to Golden Eagles. I am also concerned about the possible impact to bats, swifts, owls, sheep, and of course, the Swainson's. Other ground dwelling creatures will be affected, as well as the desert landscape. **P8-02**

Birds are having a hard enough time on their migration without the added hazard of a wind turbine farm. Resident birds will have less of a chance of survival. The desert is a special and delicate environment, not the easiest place to raise a family. Please don't make it harder on the special species that call it home now.

Please adopt a "no project" alternative. I am a green power supporter, but not at the expense of wildlife. There are other ways to make green power. We need to protect the natural areas that are left. **P8-03**

Sincerely,

Linda Bosshart

Perry, Cedric C

From: Teri Brewer <goby@mac.com>
Sent: Wednesday, September 28, 2011 11:22 PM
To: Perry, Cedric C
Subject: proposed Ocotillo windfarm

Categories: Ocotillo Exp.

Dear Mr. Perry,

I am writing to you in regards to the proposed Ocotillo wind farm. I was shocked to learn of this planned windfarm being slated for an area adjacent not only to a most significant State Park, but where it would impact the recently designated Piedras Grandes Cultural Preserve. **P9-01**

We are at a point where the technology needed to power homes in the San Diego area is increasingly affordably available through homeowner installation of solar panels on individual properties, and to disrupt the desert environment of eastern San Diego and Imperial County when the disruptions come at such a high cost is perverse. The Sunrise powerline installation may have been be unavoidable, but this project is not and I would like to add my voice to that of many others who prefer that we handle our renewable energy needs by supporting household and commercial solar installations in this region so uniquely suited to them, avoiding unnecessary wind turbine construction where it is not needed. **P9-02**

I am an admirer of much of the work that the BLM does in land management, and I can understand how this proposal developed, but there is a better solution, and compromising the Ocotillo area to provide my coastal city with another energy source at a point where passive solar installations are coming down in price and rapidly gaining public acceptance just does not make sense. I do not want to see the Anza Borrego Desert degraded to support distant energy needs which could be met locally in San Diego with little or no environmental degradation. **P9-03**

Teri Brewer
838 Isthmus Court
San Diego, CA 92109

Perry, Cedric C

From:	K. Brigger <kathywhob@yahoo.com>
Sent:	Thursday, September 29, 2011 7:27 AM
To:	Perry, Cedric C
Subject:	Wind Energy in Ocotillo
Categories:	Ocotillo Exp.

Please do not allow the wind turbines to be put in Ocotillo. This is way to close to Anza Barrego State Park.

The animals would be killed, and life for them disrupted. I am asking you to delete the proposal, and find someplace else for it.

P10-01

Thank You,

With regards,
Kathy Brigger
Concerned citizen

Comment Letter P11

From: Cindy Buxton [mailto:iokuok2@hotmail.com]
Sent: Saturday, July 09, 2011 9:44 AM
To: Angelina Havens
Subject: OCOTILLO WIND ENERGY FACILITY, OCOTILLO EXPRESS, LLC.

Dear Ms Havens,
Per your notice for Ocotillo Wind Energy Facility,

1)Is there an email address for public comments or do all comments need to be sent US Mail to the address provided?

2) I took a quick look at the DEIR and I did not see a way to download as one document. Is there a way to copy this to my desktop in one step as there are many at the link provided.

P11-01

Thank you!

Cindy Buxton

put Democracy First

Perry, Cedric C

From:	Nancy Callahan <nancybythesea@comcast.net>
Sent:	Thursday, September 29, 2011 7:55 AM
To:	Perry, Cedric C
Subject:	wind mills
Categories:	Ocotillo Exp.

Please don't place the windmills within view of the Anza Borrego State Park!
Find another location not so critical to historic, scenic, protected land.
Nancy Callahan

P12-01

Perry, Cedric C

From:	momthale@att.net
Sent:	Monday, September 19, 2011 2:45 PM
To:	Perry, Cedric C
Subject:	Pattern Energy Public Comments
Attachments:	Blm.docx; ATT00001.htm

Mr. Perry,

Per our phone conversation one day last week, I am forwarding my public comments to you so you can forward them on to whomever will be handling them.   Thank you for your help.

Betty Thale Cloud
momthale@att.net
760-358-7044

Attn: Cedric Perry

Comments from a resident of Ocotillo, CA regarding Pattern Energy's Ocotillo Wind Project. These comment were written several weeks ago and were meant to be addressed to other residents as well as to BLM and County officials in attendance. For reasons unknown to me, no public comments were made at the meeting I attended, so I am now forwarding them to you.

My name is Betty Thale-Cloud. I have lived in Ocotillo since March of 1997. I retired from the Imperial Valley Food Bank, where my position as Executive Director afforded me countless opportunities to learn about hunger and poverty throughout Imperial County and especially in my hometown of Ocotillo.

I am speaking out in favor of Pattern Energy's proposed work in our area. Let me speak first about things I know. Not things I hear about, or worry about or even wonder about, but things I know!

On August 20, 2011, as the Development Associate of the Desert Volunteers of Ocotillo Optimist Club, I wrote to Mr. Hodges of Pattern, requesting financial assistance for three projects the optimist are working on. Here's what I ask for: $20,000 for our Graduate Incentive Program; $5,000 for a fence around the basketball court at the Park; and $40,000 for a metal shade-cover over the playground equipment at the Park.

Within two days I not only had a positive response concerning all three amounts, but also the possibility of continued funding for the Graduate Incentive Program – the program which is the most important thing the Ocotillo Optimists have accomplished so far. I know that some of our high school students have already benefitted from this program. To have it funded annually with such a generous amount would be fantastic.

I want to point out some of the benefits Ocotillo has already received thanks to Pattern Energy. A $40,000 donation was made to Westside School, the elementary school that our kids attend. This money will be used to support an important program to help feed our students in need. There was a strong possibility that the Imperial School District would have to close Westside School. That thought is no longer on the table, thanks to Pattern.

Pattern also donated $10,000 to the Food Bank. And they are going to help fund the museum in Ocotillo.

Not only is Pattern working hard to respond to the concerns Ocotillo residents have about the environmental impact in our area, Pattern Energy has gone above and beyond to help fund local projects.

Far beyond the things mentioned above, I believe that it is imperative that our Country takes immediate steps to produce clean and renewable energy to replace the imported gas and oil we currently use. I read that in 2010, the United States imported natural gas and oil equivalent to more that 4 billion barrels of oil, costing American taxpayers $400 billion. Generating our own power through wind energy could make an enormous improvement in that situation!

In closing, I have often observed neighbors work to obstruct any change in our desert community. But I would ask them to look around and realize that changes occur whether or not we want them. I remember when we had a first-class restaurant south of the highway. I remember when the OTU not only sold fuel that was cheaper than in El Centro or in San Diego, it was also a great place to go when you needed a quart of milk or some other key food item. I remember when we had a library in town. I remember when we had a sheriff in town.

P13-01, cont.

But things change! And in Ocotillo too many of the changes have not been for the good!

I realize that many more changes will occur if Pattern Energy Group is successful in building wind generators in this part of the desert. I think there will be employment for some of us. And if not for more of us because we are not qualified – well maybe more schooling is one answer for that. Past history for Pattern Energy Group shows that they believe in providing direct benefits to the communities that host their wind projects.

I will keep reading and asking questions and hope my that other Ocotillo residents will too. What I have learned so far about Pattern Energy has been positive. I hope we can all get involved in upcoming changes and take advantage of benefits that we can gain from "inevitable transformations".

Thank you.
Betty Thale-Cloud
momthale@att.net

Perry, Cedric C

From: Joanne Cohen <raptorhal3@gmail.com>
Sent: Wednesday, September 28, 2011 8:39 AM
To: Perry, Cedric C
Subject: Proposed wind turbines-Ocotillo, CA

Categories: Ocotillo Exp.

Cedric Perry
California District Office
Bureau of Land Management
22835 Calle San Juan De LosLagos
Moreno Valley CA, 92553

Dear Mr. Perry:

I recently received information concerning the proposed Wind Turbine project at Ocotillo, CA. Since 2003 I have been monitoring the migration of Swainson's Hawks through Borrego Valley (Borrego Springs, CA). Our research has determined that the migration pattern involves a flight through the proposed area. I assume that an environmental assessesment has been completed or is in stages of completion. I recently reviewed a document published in 2006 concerning Wind Turbines and Birds. It was published in Canada and is entitled "Wind Turbines and Birds-A Guidance Document of Environmental Assessment." A series of quantitative data formats including the number of birds and migratory flight corridors were addressed. **P14-01**

In spring of 2011 over 8,000 Swainson's Hawks (a threatened species in California), migrated through the region slated for wind turbine construction. I would like to review any studies down to mitigate interference with the migration of Swainson's Hawks and a number of other species that migrate and inhabit the area under consideration. **P14-02**

I can be reached by email-Raptorhal3@gmail.com By phone-773-595-4484

Thank You,

Hal Cohen-Retired Professor of Biology
618 Tilting T Drive, Borrego Springs, CA 92004 PO Box 594

Comment Letter P15

Perry, Cedric C

From: Alison Coppola <acoppola@earthlink.net>
Sent: Sunday, October 02, 2011 4:03 PM
To: Perry, Cedric C
Cc: acoppola@earthlink.net
Subject: Petition for "no project" - Ocotillo Express Wind Turbine Project

Categories: Ocotillo Exp.

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Mr. Perry,

I am writing this letter to oppose the Ocotillo Express Wind Turbine Project which proposes to construct, operate, and maintain wind turbines and associated facilities directly adjacent to Anza-Borrego Desert State Park straddling Highway S-2. **P15-01**

My chief concern lies within the disruption of wildlife corridors for land animals such as desert bighorn sheep, and annual migratory flight air streams of migrating golden eagles and especially the endangered Swainson's hawk. These raptors are dependant on the windforce and altitude of naturally occuring air-streams during their annual migration through the area and cannot adapt to the impediments of wind turbines. The results will be catastrophic to the species. **P15-02**

The draft EIS does not meet NEPA requirements because it lacks a full range of alternatives, namely, the alternative of producing renewable energy on rooftops in the cities where the energy is used. **P15-03**

I advocate that th e BLM should adopt a "no-project" alternative and consider other viable alternatives that could meet the energy needs of the area while maintaining the integrity of this fragile environment and safe passage for its inhabitants.

Thank you for your consideration.

Alison Coppola
Carlsbad, CA

Perry, Cedric C

From:	Esther Corley <fecorley@cox.net>
Sent:	Thursday, September 29, 2011 9:42 AM
To:	Perry, Cedric C
Subject:	Ocotillo Wind Farm
Categories:	Ocotillo Exp.

What a bad bad idea! Why is it, that there are many places in the desert which are not in the least pretty, that projects are slated for lovely areas??? We have always treasured the pristine desert and it is rapidly being destroyed. The wildlife and flora have only humans as stewards for their whole existence. We need to do right by them. It makes me feel sick to think of the rape of our public lands. And private. Man needs places to go to to replenish spirits and souls. We beg you to reconsider. Foss & Esther Corley

P16-01

Perry, Cedric C

From: Susan Cramer <swcramer1@gmail.com>
Sent: Friday, September 30, 2011 7:55 AM
To: Perry, Cedric C

Categories: Ocotillo Exp.

No on the wind energy facility!! **P17-01**

Susan W. Cramer
E: swcramer1@gmail.com

Perry, Cedric C

From:	Susan Cramer <swcramer1@gmail.com>
Sent:	Friday, September 30, 2011 7:57 AM
To:	Perry, Cedric C
Categories:	Ocotillo Exp.

No, thank you, on the Ocotillo Wind Energy Facility. **P18-01**

Susan W. Cramer
E: swcramer1@gmail.com

Comment Letter P19

Perry, Cedric C

From: Helen Davis <helen@netidea.com>
Sent: Wednesday, September 28, 2011 4:28 PM
To: Perry, Cedric C
Subject: proposed wind turbines near Ocotillo

Categories: Ocotillo Exp.

Dear Mr. Perry:

I am disturbed by the thought of a huge amount of wind turbines up against the southern part of our beautiful Anza Borrego Desert State Park. I am a volunteer in the park and am so proud to be participating in protecting such a large area of wilderness. It is unique in North America.

For the 140,000 homes that this wind energy would supposedly power, rooftop and local distributed renewable energy generation could do the same.thing. If this project goes through, there will be irreparable damage to the landscape. I believe this project is much like the Sunrise Powerlink which was overwhelmingly opposed by residents and staff and volunteers at Anza Borrego State Park a few years ago and against which we successfully fought. I am talking about 12,00 acres of intact desert wilderness which will be impacted by this huge project.

P19-01

The south area of our wilderness park is the most pristine, the most dramatic and the least impacted by humans. Wilderness has values for all of us and for generations to come. Please do not adopt this project.

Sincerely,

Helen Davis
ABDSP volunteer and longtime Park and desert lover

Comment Letter P20

Perry, Cedric C

From: eirian@comcast.net
Sent: Saturday, October 01, 2011 8:43 PM
To: Perry, Cedric C
Cc: draegoch@comcast.net
Subject: Ocotillo Project

Categories: Ocotillo Exp.

Dear Cedric Perry and anyone in Land management
I object to the Ocotillo Exprss Wind Turbine Project!
Here are my reasons
Listen to a citizen
I Object the Project!

IT'S MORE THAN THE PARK VIEWSHED THAT IS THREATENED
By the Ocotillo Express Wind Turbine Project

Impacts to Natural Resources of Anza-Borrego Desert State Park (ABDSP):

Disruption of wildlife corridors for desert bighorn sheep.
Adverse effects to golden eagles due to the birds striking the turbines.
Adverse impacts to burrowing owls, long-eared owls, Vaux's swift, peregrine falcons, flat-tailed horned lizards, barefoot geckos, Red diamond rattlesnakes, American badgers, and several listed plant species.
Could cause significant deaths of bats due to the drop in air pressure causing internal hemorrhaging in the lungs as well as deaths from direct strikes.
Unavoidable impact to plants during construction and the introduction of invasive plant species.
Permanent scarring to the landscape leaving an "industrial" look to the area.

P20-01

Impacts to Cultural Resources of ABDSP:

Visual impacts to the newly designated Cultural Preserve at Piedras Grandes, just west of Ocotillo and its "sacred site."
No adequate accounting for impacts to the multiple cultural resources of the area when viewed as a cultural landscape.
Cultural Studies not completed prior to assessing impacts.

P20-02

Other Potential Impacts

1. Substantial increase in noise levels from the operation of the turbines, especially at night in surrounding areas.
2. Impacts to air quality from truck traffic and from concrete batch plants.
3. Increased risk of wildfire hazards.
4. Loss of soil's ability to absorb carbon from scraping.
5. Degradation to the recreational and natural experience of ABDSP by the sight of the turbines and associated facilities.
6. Loss of dark night skies.
7. Degradation of wilderness character of the several BLM wildernesses surrounding the proposed project.

P20-03

The NEPA Document does not include an alternative for production of renewable energy at point of use in cities and thus the Draft EIR/EIS is incomplete.

Please adopt the "no project" alternative and protect this important desert habitat from devastation by private industry for private profit!

P20-04

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov

FAX a copy to the State Clearinghouse: 916-323-3018

Comment Letter P21

RECEIVED
BUREAU OF LAND MGMT.
MAIL ROOM
11 SEP 30 PM 4:06
CALIF. DESERT DISTRICT
MORENO VALLEY, CA

September 29, 2011

Cedric Perry
California Desert District Office Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553 cperry@blm.gov

Sir:

The proposed Ocotillo Wind Energy Facility adjacent to the Anza Borrego State Park will impact negatively on the park and the surrounding landscape.

The project is not needed, and will destroy a significant desert landscape.

P21-01

Yours truly,

Carole & Ivan Edelman

Carole & Ivan Edelman
4545 Normandie Place
La Mesa, CA 91942

Perry, Cedric C

From: Ned Engle <nedengle@comcast.net>
Sent: Thursday, September 29, 2011 8:26 AM
To: Perry, Cedric C

Categories: Ocotillo Exp.

Please do what you can to halt the Ocotillo Wind Farm. Once something like this goes up, it will never be taken down.....our beautiful world is changed forever. **P22-01**

Edward Engle
Mill Valley, CA

ADAMS BROADWELL JOSEPH & CARDOZO
A PROFESSIONAL CORPORATION

ATTORNEYS AT LAW

520 CAPITOL MALL, SUITE 350
SACRAMENTO, CA 95814-4721

TEL: (916) 444-6201
FAX: (916) 444-6209
tenslow@adamsbroadwell.com

DANIEL L. CARDOZO
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TANYA A. GULESSERIAN
MARC D. JOSEPH
ELIZABETH KLEBANER
RACHAEL E. KOSS
ROBYN C. PURCHIA

OF COUNSEL
THOMAS R. ADAMS
ANN BROADWELL

SO. SAN FRANCISCO OFFICE

601 GATEWAY BLVD., SUITE 1000
SO. SAN FRANCISCO, CA 94080

TEL: (650) 589-1660
FAX: (650) 589-5062

September 21, 2011

VIA FACSIMILE AND U.S. MAIL

Cedric Perry
Project Manager
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
Fax: (951) 697-5299

Sean M. Moore, AICP
Planning Division Manager
Imperial County Planning & Development Services
801 Main Street
El Centro, CA 92243
Fax: (760) 353-8338

Sylvia Bermudez
Clerk of the Board of Supervisors
Imperial County
940 West Main Street, Suite 209
El Centro, CA 92243
Fax: (760) 482-4215

Re: Request for Extension of Public Comment Period on Ocotillo Express Wind Energy Project Draft Environmental Impact Statement / Environmental Impact Report

Dear Mr. Perry, Mr. Moore and Ms. Bermudez:

P23-01

We respectfully request an extension of time to comment on the Draft Environmental Impact Statement / Environmental Impact Report ("Draft EIS/EIR") for the Ocotillo Express Wind Energy Project ("Project"). This request for extension is based on Imperial County's ("County") failure to make all documents referenced and relied upon in the Draft EIS/EIR immediately available and the County's

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inability to respond to our Public Records Act ("PRA") request until September 30, 2011, just six days prior to the deadline for public comments on the Draft EIS/EIR. The request for an extension is also based on the failure to complete and make available to the public relevant surveys and mitigation plans prior to the beginning of the public comment period.

P23-01, cont.

The California Environmental Quality Act ("CEQA") and the CEQA Guidelines require that "all documents referenced in the EIR" must be "readily accessible to the public" during the entire comment period.[1] The California Constitution and the California Public Records Act, also provide the public with a constitutional and statutory right to access information concerning the conduct of the government.[2] According to the Constitution, any statutory right to information shall be broadly construed to provide the greatest access to government information and further requires that any statute that limits the right of access to information shall be narrowly construed.

Pursuant to these constitutional and statutory rights to public information, this Firm submitted a Public Records Act request to the County on August 30, 2011. The request was for "[a]ll documents referred to or relied upon in the Draft Environmental Impact Report/Environmental Impact Statement (June 2011) that are not available on the County's or Bureau of Land Management Web site for the Project" as well as "[a]ny and all file materials for the Project; and [a]ny and all correspondence, resolutions, memos, notes, analyses, electronic mail messages, files, maps, charts, and/or any other documents by, to or from Imperial County or staff referring or relating to the Project.

P23-02

The County responded in a letter dated September 16, 2011 that it possessed documents responsive to our request, but that it would require an extension of time under Government Code section 6253(c) in order to complete its review of the records and compile copies due to the "voluminous nature of the records and the possible need for consultation." The County stated that it would need an additional 14 days to provide the documents.

P23-03

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[1] See Pub. Resources Code, § 21092, subd. (b)(1); Cal. Code Regs., tit. 14, § 15087, subd. (c)(5).

[2] See Cal. Const., art. I, § 3, subd. (b); California Public Records Act, Gov. Code, §§ 6250 et seq.

P23-04

The public comment deadline for the Draft EIS/EIR is October 6, 2011. Since the County is proposing providing us the requested documents on September 30, 2011, it would be impossible to review the documents we have requested in time to provide meaningful comments on the Draft EIR/EIS by the public comment deadline. In particular, the following documents referenced in the Draft EIR/EIS, and not available on the Imperial County website, are critical to allowing a meaningful review of the Draft EIR/EIS:

- Tierra (Tierra Environmental Services). 2010a. Final Class II and III Inventory Research Design and Work Plan for the Ocotillo Express Wind Energy Project, Imperial County, California.
- Tierra (Tierra Environmental Services). 2011a. Draft Archaeological Survey Report for the Ocotillo Express Wind Energy Project, Imperial County, California.
- Tierra (Tierra Environmental Services). 2011b. The Preliminary Historical Resources Reconnaissance Survey/Evaluation for the Ocotillo Express Wind Energy Project, May 2011.
- Burns & McDonnell. 2010. Corridor Conflict Analysis for the Ocotillo Express Wind Farm Project CACA-51552. Burns & McDonnell Engineering Company, Inc. July 2010.
- Emory, Neil. 2011. Record of Conversation between Lisa Blewitt of Aspen Environmental Group and Neil Emory, Owner/Manager of the Emory Ranch Airport. January 3.
- HELIX (HELIX Environmental Planning, Inc.). 2011. Personal communication via email between Shelby Howard, Biology Group Manager, HELIX Environmental Planning, and Aubrey Mescher, Associate Environmental Planner, Aspen Environmental Group. March 14.
- NAA (Neil O. Anderson & Associates, Inc.). 2010. Preliminary Geotechnical Investigation, Ocotillo Express Wind Farm, Phase 1,

Between Imperial Highway and Interstate [8], West of Ocotillo, California. Prepared for Pattern Energy. September 27.

- OE (Ocotillo Express, LLC). 2010. Ocotillo Express Wind Facility Plan of Development.
- Aspen (Aspen Environmental Group). 2011. Ambient noise measurements completed by Jon Davidson and Stan Yeh on January 6, 2011 and January 7, 2011.
- Pattern (Pattern Energy Group LP). 2010. Conditional Use Permit Application submitted to Imperial County, including the Plan of Development.
- Aron, G.L. and Kelly, J., 2010, Confidential paleontological assessment technical report, Ocotillo Express Wind Project: Unpublished report submitted to Aspen Environmental Group and the El Centro BLM Field Office.
- Aron, G.L., and Kelly, J., 2011. Confidential paleontological survey report, Ocotillo Express Wind Project: Unpublished report submitted to Aspen Environmental Group and the El Centro BLM Field Office.
- BLM (U.S. Bureau of Land Management). 2008. Assessment and Mitigation of Potential Impacts to Paleontological Resources: BLM Instruction Memorandum No. 2009-011.
- Jefferson, G. 2011. Written communication providing tentative identifications of fossils recovered during the field survey.
- DOD (Defense of Defense). 2010. Personal communication. Letter from A.M. Parisi of the Department of the Navy, Naval Air Warfare Center Weapons Division, to Jack Hamby, Acting District Manager, BLM California Desert District. May 25.

P23-04, cont.

- EDR (Environmental Data Resources, Inc.). 2011. EDR Geocheck Report, Ocotillo Wind Power Area Study. Inquiry Number 2984393.2s. February 4, 2011.
- Pattern (Pattern Energy Group LP). 2011. Personal communication. Email transmitted by Natalie McCue of Pattern to Jon Davidson of Aspen. January 27.
- LL&G. 2011. Traffic Impact Analysis, Ocotillo Wind Energy Facility, County of Imperial, California, March 17, 2011.
- BLM (U.S. Bureau of Land Management). 2009. Survey Protocols for NEPA/ESA Compliance for BLM Special Status Plant Species.
- CDFG (California Department of Fish and Game). 2009. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities. November 24.
- HELIX (HELIX Environmental Planning, Inc.). 2011a. Biological Technical Report for Ocotillo Express Wind Project. June 14.
- HELIX (HELIX Environmental Planning, Inc.). 2011b. Jurisdictional Delineation for Ocotillo Wind Energy Facility. April 25.
- HELIX (HELIX Environmental Planning, Inc.). 2010. Ocotillo Wind Energy Project Spring 2010 Rare Plant Survey Report. November 10.
- Mattson, M., M. Bantilan-Smith, L. Cervantes, R. Lichvar and K. Curtis. 2010. Personal communication between the aforementioned and B. Jones, S. Howard and W.L. Sward of HELIX. November 12.
- NAA (Neil O. Anderson & Associates, Inc.). 2011. Hydrological and Environmental Hazard Assessment. Ocotillo Express Wind Farm, Imperial County. February 18.

P23-04, cont.

- Boyce, Walter. 2011. Ocotillo Express Project and Bighorn Sheep: Impacts and Recommendations. April 15.
- CEC and CDFG (California Energy Commission and California Department of Fish and Game). 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Commission Final Report. California Energy Commission, Renewables Committee, and Energy Facilities Siting Division, and California Department of Fish and Game, Resources Management and Policy Division. CEC-700-2007-008-CMF.
- CSP (California State Parks). 2007. HELIX communication with Anza-Borrego Desert State Park staff, Conservation Biology Institute, U.S. Fish and Wildlife Service, and California Department of Fish and Game. February 1.
- Dugan, E.A. 2011. Barefoot Banded Gecko Report for the Ocotillo Wind Energy Project. January 7.
- HELIX (HELIX Environmental Planning, Inc.). 2010a. Ocotillo Wind Energy Project, Proposed Biology Survey Protocols. February 17.
- HELIX (HELIX Environmental Planning, Inc.). 2010b. Ocotillo Wind Energy Project, Flat-Tailed Horned Lizard Survey Report. October 25.
- HELIX (HELIX Environmental Planning, Inc.). 2010c. Ocotillo Wind Energy Project, Raptor Migration Report. December 7.
- HELIX (HELIX Environmental Planning, Inc.). 2010d. Ocotillo Wind Energy Project, Avian Point Count Report. December 7.
- HELIX (HELIX Environmental Planning, Inc.). 2010e. Results of 2010 Burrowing Owl Surveys for the Ocotillo Wind Energy Project. December 9.
- OE (Ocotillo Express, LLC). 2011. Ocotillo Wind Energy Facility Plan of Development (Draft). March 16.

P23-04, cont.

- OE (Ocotillo Express, LLC). 2010. Ocotillo Express Wind Facility Plan of Development Draft. October.
- OE (Ocotillo Express, LLC). 2010. Draft Plan of Development.
- Rahn Conservation Consulting. 2011. Bat Surveys for Ocotillo Wind Energy Project. January.
- USFWS (U.S. Fish and Wildlife Service). 2010b. Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Golden Eagle Management and Permit Issuance. February.
- Unitt, P.A. 2007. Collection Manager, Department of Birds and Mammals, San Diego Natural History Museum. E-mail communication to HELIX for the Sunrise Powerlink Project, May 29 and June 6.
- WRI (Wildlife Research Institute, Inc.). 2011. [Confidential] Golden Eagle Surveys Surrounding the Ocotillo Express Wind Farm Project Area in Imperial County, California. January 11.
- Aspen (Aspen Environmental Group). 2011. Personal communication between Lisa Blewitt and Cassandra Garza of Aspen Environmental Group. March 25.
- Emory, Neil. 2011. Record of Conversation between Lisa Blewitt of Aspen Environmental Group and Neil Emory, Owner/Manager of the Emory Ranch Airport. January 3.
- Navcon (Navcon Engineering Network). 2011. Calculation Service, Project #102360. Performed by Hans J. Forschner. May 12. Provided in Appendix F.
- Pattern (Pattern Energy Group LP). 2010a. Ocotillo Express Wind Facility Plan of Development Data Request 1. May 3.

P23-04, cont.

- Pattern (Pattern Energy Group LP). 2010b. Ocotillo Express Wind Facility Plan of Development Data Request 2. August.
- Pattern (Pattern Energy Group LP). 2010c. Ocotillo Express Wind Facility Plan of Development Data Request 3 (Revision). December 8.
- Pattern (Pattern Energy Group LP). 2010d. Ocotillo Express Wind Facility Plan of Development Data Request 4. December 8.
- Paleo Solutions, Inc. 2011. Email from Geraldine Aron of Paleo Solutions, Inc. to Jon Davidson of Aspen Environmental Group with subject "Re: OWEF paleo impact section". Attachments Ocotillo Express Paleo Resource Impacts Summary Table_FinalFinal.docx and OWEF 4-10_Paleontological_Resources_Reviewed-LB_GLA.docx. Received June 21.
- LL&G. 2011. Traffic Impact Analysis, Ocotillo Wind Energy Facility, County of Imperial, California, March 17, 2011.
- Strong, 2011. Personal communication via electronic mail from Vida Strong of Aspen Environmental Group to Jon Davidson and Aubrey Mescher of Aspen Environmental Group. Use of IID water for Sunrise construction. April 20.
- The California Burrowing Owl Consortium (CBOC). 1993. Burrowing Owl Survey Protocol and Mitigation Guidelines. April.
- CDFG (California Department of Fish and Game). 1995. Staff Report on Burrowing Owl Mitigation.
- CDFG (California Department of Fish and Game). 2010. Survey Protocol for the Barefoot Banded Gecko (*Coleonyx switaki*).
- CEC (California Energy Commission). 2007. California Guidelines for Reducing Impacts to Birds and Bats From Wind Energy Development (Final Report). October.

P23-04, cont.

- USFWS (U.S. Fish and Wildlife Service). 2010. Interim Guidelines for the Development of a Project Specific Avian and Bat Protection Plan for Wind Energy Facilities.
- Pine Valley Water Supply Assessment. (See Draft EIS/EIR at p. 2-9.)

P23-04, cont.

The County must make all of the documents referenced and relied upon in the Draft EIS/EIR immediately available during the entire public review period. Because the County has failed to respond to this Firm's PRA request with the above listed documents, we cannot meaningfully review the County's analyses and conclusions in the Draft EIS/EIR. We, therefore, require additional time to review the Draft EIS/EIR and supporting documentation.

P23-05

In addition, the County is unable to respond to our PRA request for all file materials related to the Project until September 30, 2011. The County's file materials related to this Project provide a complete picture of the Project's impacts and feasible mitigation measures that the County may have failed to notice. This information is essential for a meaningful review of the Project.

P23-06

Finally, the Draft EIS/EIR indicates that the following yet-to-be-completed surveys, studies and reports are necessary to determine fully the potential impacts of the Project or to identify appropriate mitigation for the Project:

- Updated FAA Determination of No Hazard (Draft EIS/EIR at p. 2-14.)
- Avian and Bat Protection Plan (Draft EIS/EIR at p. 2-17; Mitigation Measure Wild-1p.)
- Eagle Conservation Plan (Draft EIS/EIR at p. 2-17; Mitigation Measure Wild-1o.)
- Spill Prevention Containment and Countermeasure Plan (Draft EIS/EIR at p. 2-17.)

P23-07

- List of Best Management Practices for construction and operational activities (Draft EIS/EIR at p. 2-18.)
- Transportation plan (Draft EIS/EIR at p. 2-18.)
- Traffic management plan (Draft EIS/EIR at p. 2-18.)
- Dust abatement plan for construction (Draft EIS/EIR at p. 2-18.)
- Storm Water Pollution Prevention Plan (Draft EIS/EIR at p. 2-18; Mitigation Measure Water-9.)
- Construction waste management plan (Draft EIS/EIR at p. 2-19.)
- Cultural resource monitoring and mitigation plan (Draft EIS/EIR at p. 2-19.)
- Restoration plan (Draft EIS/EIR at p. 2-19.)
- Noxious weed and invasive species control plan (Draft EIS/EIR at p. 2-20; Mitigation Measure Veg-1d.)
- Integrated pest management plan (Draft EIS/EIR at p. 2-20.)
- Updated FAA "Determination of No Hazard" (Draft EIS/EIR at p. 2-14; Mitigation Measure PHS-1.)
- Special status plant species surveys "for all portions of the proposed project that have not been previously surveyed" (Draft EIS/EIR at p. 4.17-25; Mitigation Measure Veg-1c.)
- Barefoot banded gecko survey of the Site 2 areas "that fall outside of the 2010 barefoot banded gecko survey area." (Draft EIS/EIR at p. 4.21-3; Mitigation Measure Wild-1k.)

- Geotechnical studies and recommended mitigation measures (Mitigation Measures PHS-3, Soil-1.)
- Habitat compensation land preservation or mitigation fee payment plan (Mitigation Measure Veg-2a.)
- Habitat Restoration/Revegetation Plan (Mitigation Measure Veg-2b.)
- Jurisdictional mitigation plan (Mitigation Measure Veg-3.)
- Water supply contingency plan (Mitigation Measure Water-2.)
- Onsite drainage improvement design (Mitigation Measure Water-4.)
- Flood and erosion structure damage protection plan (Mitigation Measure Water-8.)
- Fire safety plan (Mitigation Measure Fire-1.)
- Raven control plan (Mitigation Measure Wild-1j.)
- Burrowing owl surveys for "all areas not previously surveyed" (Mitigation Measure Wild-11.)
- Bighorn sheep mitigation and monitoring plan (Mitigation Measure Wild-1r.)
- American badger survey (Mitigation Measure Wild-2c.)

P23-07, cont.

The Courts have held that simply requiring a project applicant to obtain a future report and then comply with any recommendations that may be made based upon the report is insufficient to comply with the requirements of CEQA.[3] Since CEQA does not permit deferral of the identification of Project impacts or mitigation,

P23-08

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[3] *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359, 1393; *Quail Botanical Gardens Foundation v. City of Encinitas* (1994) 29 Cal.App.4th 1597, 1604, fn. 5.

we request that the public comment period be extended until after these additional surveys, studies and reports are completed and made available for public review. **P23-08, cont.**

We request an estimate of the costs of production prior to the making of any copies in response to our request. If documents are available electronically, we request to be provided the documents on cd-rom. Documents may also be provided to us via email if less than 10 MB in size. We do not require copies of referenced documents for which working website links were provided in Chapter 8 of the Draft EIS/EIR. We also do not require copies of any appendices or other documents available on the County's website at http://www.icpds.com/?pid=2843. If other documents are also available on the Internet, the provision of a working website link for the document will suffice. **P23-09**

Please feel free to call me at (916) 444-6201 or email me at tenslow@adamsbroadwell.com with any questions regarding this request. Thank you for your attention to this matter.

Sincerely,

Thomas A. Enslow

TAE:cnh

cc: Daniel Steward
BLM, El Centro Field Office Resource, Branch Chief

Angelina Havens
Planner II, Imperial County Planning & Development Services

Comment Letter P24

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 07, 2011 8:16 AM
To: jim_kenna@blm.gov
Subject: (no subject)

Mr Kenna:

My name is Parke Ewing, I live at 98 W. Imperial Highway, Ocotillo, Ca. 92259. Mr Kenna, as you well know Pattern Energy has proposed a wind turbine project North and West of the town of Ocotillo. My retirement property and current full time residence will be surrounded by estimated 220 degrees of over 400 ft. tall wind generators if this project is allowed to be constructed. Mr. Kenna, we of Ocotillo are all for renewable energy projects including wind turbines if they are located away from small residential towns. We here in Ocotillo are mainly of lower income retired families and can not afford to hire expensive lawyers to fight off these very offensive proposed wind generator projects. Pattern Energy has a pattern of exploiting small towns such as Ocotillo. Our property values have plummeted since this project was announced and will continue to plummet if these huge generators are allowed to be constructed. We will be forced to relocate, but property devaluation will inhibit most of us from actually moving due to the simple fact that we won't be able to sell our property at a reasonable price. P24-01

Several of these wind generators are proposed to be constructed less than one mile from my residence. It has not been proven, but many poeple living closer than two miles from a wind turbine have reported health problems. I don't want to be one of those people. I'm actually getting sick to my stomach just thinking that I'll have to look at them 24 hours a day for the rest of my life. P24-02

Pattern Energy say's that many people will benifit from these generators. It certainly isn't anyone in Ocotillo or El Centro for that matter. An alternative to these ugly wind generators would be simply require the end users to install voltiac cells on their existing roofs. In fact Pattern Energt could do that for them, and collect the money. Or they could relocate us at their expence to an area other than Ocotillo. We should not be the end losers here in Ocotillo, when many others will benifit. P24-03

Mr. Kenna, what can you do to help me and this community? P24-04

Thank you: Parke Ewing (7604552919)

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 07, 2011 11:10 AM
To: Angelina Havens
Subject: Meeting Ocotillo Wind Project

The proposed meeting to allow comments on the Ocotillo Wind Energy Project EIR/EIS is scheduled for a week night and this time at a month when a good percentage of the Ocotillo Residents are away on vacation to avoid the August heat. I know this project is on a fast rack, but the scheduled meeting for August 25th in Ocotillo should be rescheduled simply to show a good faith effort that the Imperial Valley Planning and Development Dept. and The Bureau of Land Management actually care about the people of Ocotillo.

A late October meeting on a Saturday would assure that many more of our Ocotillo residents could actually comment on such a huge project that will effect all of our lives and that our comments are not just blowing in the wind... Please keep in mind that over 95% of the Ocotillo residents are against this project.

Please reschedule this proposed meeting.

P25-01

Very sincerely:

Parke Ewing
98 Imperial Highway
Ocotillo, Ca. 92259

Comment Letter P26

From: EwingDuo@aol.com
To: Angelina Havens; caocotillo@blm.gov
Subject: Windmills are dying in Europe
Date: Tuesday, August 30, 2011 8:23:19 PM

Re: The proposed Ocotillo Wind Energy Prject

EIR/EIS report: Health Issues, property devaluation, annoyance issues in Europe are halting the construction of WTG projects.

http://frontpagemag.com/2011/08/28/wind-power-is-dying/

P26-01

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com
Sent: Saturday, September 03, 2011 4:31 PM
To: Angelina Havens; caocotillo@blm.gov
Subject: Ocotillo Wind Energy Project (Comment #37)

I demand that Imperial Valley Planning Dept. and the BLM perform scientific studies on Low Frequency Sound emissions and health hazards related to Electro Magnetic Fields before approving any renewable energy projects located in the Imperial Valley and especially near residential homes. Safe setbacks from wind turbine generators have not been established. You have the responsibility to assure that I continue to live in a safe environment. **P27-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P28

From: EwingDuo@aol.com
Sent: Saturday, September 03, 2011 6:28 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #38)

I live in Ocotillo and I am opposed to any future zoning changes that could allow the existing building height limits to change. I am also very concerned that the Limited Use Area now designated for Bureau of Land Managed property not be changed **P28-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P29

From: EwingDuo@aol.com
Sent: Saturday, September 03, 2011 7:45 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #39)

Re: The California Desert Conservation Act, the term "Right of Way" was intended for public utility companies to cross or distribute their product through the area of Bureau of Land Management (BLM) managed property. The term did not intend that utility generating companies could construct a power generating facility and designate the entire facility as a "Right of Way." Therefore I demand that the"Right of Way" requested by Pattern Energy not be granted. **P29-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: *Ocotillo Wind Energy Project*

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com
Sent: Sunday, September 04, 2011 3:15 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #40)

I agree with every comment and concern that has been documented by the "Basin and Range Watch" and "To Protect Our Communities Foundation." P30-01

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com
Sent: Sunday, September 04, 2011 3:27 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #41)

I urge initiation of funding for an unbiased third party peer-reviewed full spectrum noise, electrical, EMF, & health studies using scientific methods and the correct measuring tools. I don't believe the wind developers when they speak. Verified distances (set-backs) from residential homes and wind turbine generators has not been scientifically proven. This project should not be built, not only for those reasons, but because the proposed project would also be located in a designated "Limited Use Area." **P31-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: *Ocotillo Wind Energy Project*

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com
Sent: Sunday, September 04, 2011 4:35 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project
Attachments: Memo health dept..htm

Please see attached letter to: Imperial County Health Dept., concerning no safe set-back zones between homes and wind turbine generator projects in the Imperial Valley. Because there have been no studies that have proven a "Safe" set-back. **P32-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P32

Sept. 3, 2011

To: Imperial Valley County Health Department
Robin Hodgkin, M.P.A., Department Director
Dr. Stephan Munday M.D. , M.P.H., M.S.

From: Parke Ewing (Ocotillo Resident)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259
Ph. 760-358-7221

Re: Proposed "Ocotillo Wind Energy Project"

You may have been advised that a wind turbine generator project is proposed in the town of Ocotillo. Several Wind Turbine Generators (WTG's) could be located within 3/4 of a mile from my residence. I am very concerned of future health issues that could be related to this project. Those concerns are with low frequency noise emissions and Electro Magnetic Fields (EMF). The Imperial County Health Dept. has not adopted safe set-back zones for these types of projects. There are no scientific studies that have proven a safe set- back distance to residential homes. Since Imperial County has not adopted a safe set-back for the Imperial County, because there are none available, I demand that this project not be granted.

As you very well know, it is the responsibility of the health department to assure that residents live in a safe environment. You may consider commenting on this project to the board of supervisors. You may also contact the Bureau of Land Management at: caocotillo@blm.gov or Imperial Valley Planning Dept. at: angelinahavens@co.imperial.ca.gov

Thank you very much for the continued concern for the people of Imperial Valley.

Very Sincerely:

Parke Ewing

Comment Letter P33

From: EwingDuo@aol.com
Sent: Sunday, September 04, 2011 8:26 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #43)

Re: 4.11.13 Public Health - Wind Turbine Syndrome, The statement "Without any recognized regulatory guidance or thresholds related to WTS, potential impacts cannot be quantified or qualified. I demand that proper scientific studies be performed prior to granting a ROW agreement. My research has concluded that Wind Turbine Syndrome is a very real health issue and will have a dramatic impact on the residents of Ocotillo. **P33-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P34

From: EwingDuo@aol.com
Sent: Sunday, September 04, 2011 8:38 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #44)

Re: 4.11-13 Public Health, Electromagnetic Fields - The state has not adopted any specific limits or regulation on EMF levels related to electric power facilities. And due to the underground insatallation of the proposed collection lines and the lack of nearby receptors, long term exposure to EMF's related to the collection and transmission line is not expected to occur. WHAT, since no scientific studies have been performed, how is it possible to assume that no EMF exposure could occur simply because the lines are underground? The word not "expected" is not adequate to determine that no health issues WILL occur. Proper peer scientific studies are needed before any determination on the effects of EMF can be assumed. **P34-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

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The subject line should be: *Ocotillo Wind Energy Project*

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PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com
Sent: Sunday, September 04, 2011 9:05 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #45)

Re: Table 4.16-6 Peak Hour Traffic
Am I reading this correctly, if AM work hours of 10 hours per day are being worked or if PM work hours of 10 hours per day are worked, I assume the time of day would be based on desert temperature, then an additional 916 total vehicle trips through the town of Ocotillo per day will be added? That is "MAJOR" additional traffic. The roads, residents, law enforcement, emergency teams, vendors, and visitors will be completely overwhelmed with this additional traffic. Currently the Imperial County Road Maintenance Dept. cannot keep pace with road maintenance, how can they maintain roads with this additional traffic? Where will the money come from? Will the Highway Patrol assign extra officers to patrol this area? Where will the money come from? Don't say from the tax money this project may generate! **P35-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

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Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com
Sent: Sunday, September 04, 2011 9:41 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project

Re: 4.17-10 Mitigation Measures

During the construction of the nearby Sunrise Power Link, I noticed that many areas of construction had encroached past the boundaries of the designated construction delineated areas and into the areas of 'Limited Use." All roadways and tower sites were carefully staked and a hub was placed at the base of the identifying stake. Most stakes had an offset of 5' from hub written on the stake. After grading and construction traffic the offset from hub ended up being 0' - 3' thereby encroaching 2' - 5' into the limited use area on both sides of the road. Will the "Designated Biologist" be allowed to overlook the problem on this proposed project? If the BLM approves a plan, who will actually enforce it? Will there be a contact phone number and a designated response time for the contractor to respond? What are the penalties imposed on a contractor that encroaches outside of the approved boundaries? **P36-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

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The subject line should be: Ocotillo Wind Energy Project

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Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P37

From: EwingDuo@aol.com
Sent: Monday, September 05, 2011 6:17 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #47)

Re: 2.1.3.2.1 Construction

The statement that "It is anticipated the majority of construction personnel would be local residents of the Imperial Valley". How can that statement be assumed to be correct? I would say that the majority of construction personnel would be from outside of this area. Unless Pattern Energy plans on implementing a training program for employees, I would not say that statement is correct. I have seen no advertisements stating that a training program is in the future. **P37-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

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The subject line should be: Ocotillo Wind Energy Project

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P38

From: EwingDuo@aol.com
Sent: Monday, September 05, 2011 6:26 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #48)

Re: 4.4.1.8 Peninsula Bighorn Sheep

The statement that the OWEF will have no "direct" impacts on bighorn sheep is not sufficient. The indirect impacts on the bighorn sheep should also be analyzed. For instance the bighorn sheep may decide to change their habitant area that could force the reduction of their quantities. Further studies are required. **P38-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

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The subject line should be: Ocotillo Wind Energy Project

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com
Sent: Monday, September 05, 2011 7:06 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #49)

Re: 3.1.2.1 Special Status Plants

Helix Biologists and subcontracted botanists evidently conducted surveys of the proposed OWEF site between March thru April of 2010 and October thru December, redesigned portions of the project were conducted in January, February and April of 2011. We the locals look forward to checking out the desert for the flower bloom. The time frame in 2010 that the survey was conducted was too late to accurately locate many of the wild flowers (special status plants), for some reason last year had an early bloom, and this year (2011) during January, February and April, we found very few flowers in bloom. My concern is that maybe the special status plants were not found because they did not grow this year. That fact could alter the accurate count needed for the EIR. **P39-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

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Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com
Sent: Monday, September 05, 2011 7:26 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #50)

Re: Construction Dust control

The draft EIR/EIS states that a chemical road stabilization product may be used to control dust. These products have the ability to kill vegetation. They could also penetrate our sole source aquifer contaminating our drinking water. They can kill wildlife. They can be blown toward residents of Ocotillo and cause additional health issues. The chemical easily be spread by thundershowers therefore harming people, wildlife and vegetation much further away from the OWEF site. **P40-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

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The subject line should be: Ocotillo Wind Energy Project

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com
Sent: Wednesday, September 07, 2011 6:47 PM
To: Jack Terrazas; Angelina Havens
Subject: Ocotillo Meeting - Jack Terrazas

(PROPOSED)

OCOTILLO WIND ENERGY PROJECT

MEETING

Saturday, September 17, 2011 @ 9:00 AM

Ocotillo Community Park

(1 mile Northwest of Shell Canyon Road)

County Supervisor: JACK TERRAZAS

Mr. Terrazas has agreed to listen to our comments concerning the proposed Ocotillo Wind Energy Project. This will be an open meeting for all concerned people.

Thank you: Parke Ewing

I adamantly oppose the construction of the Ocotillo Wind Energy Project
Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: *Ocotillo Wind Energy Project*

P41-01

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com
Sent: Wednesday, September 14, 2011 8:45 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #51)

I demand an open comment meeting with BLM representatives regarding the proposed Ocotillo Wind Energy Project. The public comment meeting of 8/25/11 located in Ocotillo did not allow the public to verbally comment on this project. Since this meeting, BLM has reconsidered this change and has now began to allow public comments. The public and the citizens that live in community of Ocotillo now again deserve to voice their concerns, ask questions and listen to other people's comments. The comment deadline for this project needs to be extended and a public comment meeting needs to be scheduled. **P42-01**

Very Sincerely:
Parke Ewing

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: *Ocotillo Wind Energy Project*

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com
Sent: Wednesday, September 14, 2011 8:57 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #52)

Will the Ocotillo Wind Energy Project and Pattern Energy LLC receive grant funding and loan guarantees similar to Solyndra Company? What guarantees will be in place to stop Pattern from filling bankruptcy or selling the Ocotillo Wind Energy Project after they receive their grant money or if in the future they decide they are not making enough money and sell or even worse abandon the project. I don't want my tax dollars given to Pattern Energy. **P43-01**

Very Sincerely:
Parke Ewing

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com
To: Angelina Havens; caocotillo@blm.gov
Subject: Check out North American Platform Against Windpower
Date: Sunday, September 18, 2011 9:27:49 AM

Ocotillo Wind Energy Project

North American Platform Against Windpower

P44-01

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P45

From: EwingDuo@aol.com
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #54)
Date: Monday, September 26, 2011 5:15:00 AM

I demand to see the current DEIR/EIS comments for this project. When we, the citizens, all attended the BLM comment meetings on August 24 and 25, 2011 we were not allowed to comment as in previous meetings. It appears that Pattern Energy is allowed to review these comments. The public has the right to also review the comments. Many people could offer clarification and additional needed information to these comments if they knew what they were. Or has the approval of this hideous project already been determined in backroom meetings? Jim Childers, representing the BLM at the 8/25/11 meeting in Ocotillo told me that he would display the comments. Where are they? **P45-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P46

From: EwingDuo@aol.com
To: caocotillo@blm.gov; Angelina Havens
Subject: Check out State agrees to study Falmouth turbine noise | Mobile - CapeCodOnli
Date: Saturday, September 24, 2011 2:03:59 PM

Health Impact Studies needed before approval of wind turbines. Please see link below. Don't let your rush to approve these hideous projects effect the future health of the residents of Ocotillo. **P46-01**

State agrees to study Falmouth turbine noise | Mobile - CapeCodOnline.com

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P47

From: EwingDuo@aol.com
To: caocotillo@blm.gov; Angelina Havens
Subject: Check out Family sues wind farm alleging health damage, falling property valu
Date: Saturday, September 24, 2011 2:13:30 PM

P47-01

Another family sues over health effects from wind turbines. Don't you see a trend here to stop these projects until setbacks and noise levels can be scientifically analyzed. Please see link attached below:

http://www.youtube.com/user/adamme1958
Family sues wind farm alleging health damage, falling property value - thestar.com

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P48

From: EwingDuo@aol.com
Sent: Monday, September 26, 2011 5:05 AM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project

Let it be known that Angelina Havens a planner for Imperial County, could be in a very biased position. Her family owns Havens Trucking located in El Centro. Havens Trucking is specifically in business to transport road material, base, sand and gravel . Her family would benefit tremendously from the approval of the Ocotillo Wind Energy Project, by simply hauling road base material for the additional 42 miles of roads that will be required for this hideous project. I demand that she be removed from any oversight, voting or any possibility of influence in any way for this project. To allow her to be any part of this project in the past has been in error and she should immediately be removed. I hope it is not too late. This situation is absolutely a kick in the face for the people of Ocotillo and anyone else concerned about the destruction that this proposed project will do to the community and the desert around Ocotillo. This project already stinks from internal government pressure, we don't need anymore smell from our local representatives.

P48-01

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project (Comment #55)
Date: Monday, September 26, 2011 5:18:20 AM

WE DON'T WANT THIS PROJECT...

P49-01

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com
Sent: Monday, September 26, 2011 6:00 AM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Energy Project

THE PROPOSED LOCATION FOR THIS PROJECT, except for 1 turbine, IS DESIGNATED AS A "LIMITED USE" AREA, BY THE BLM. I DEMAND THAT DESIGNATION NOT BE MODIFIED OR CHANGED.

P50-01

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: *Ocotillo Wind Energy Project*

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Perry, Cedric C

From: Linda Foote <lfoote@mcn.org>
Sent: Thursday, September 29, 2011 8:11 AM
To: Perry, Cedric C
Subject: Ocotillo Express Wind Turbine Project

Categories: Ocotillo Exp.

Dear Mr. Perry,

I am dismayed that your office is considering the Ocotillo Express Wind Turbine Project. Anza Borrego State Park has been a destination of mine for over 15 years. I recently started volunteering by removing invasive plants to help keep the park's natural beauty and bio-diversity intact. I have a deep personal connection to the incredible beauty that will be irretrievable if this project goes through. Certainly, you have been informed of the impact such a project will have in the area, but let me restate them here: **P51-01**

Impacts to Natural Resources of Anza-Borrego Desert State Park (ABDSP):

P51-02

1. Disruption of wildlife corridors for desert bighorn sheep.
2. Adverse effects to golden eagles due to the birds striking the turbines.
3. Adverse impacts to burrowing owls, long-eared owls, Vaux's swift, peregrine falcons, flat-tailed horned lizards, barefoot geckos, Red diamond rattlesnakes, American badgers, and several listed plant species.
4. Could cause significant deaths of bats due to the drop in air pressure causing internal hemorrhaging in the lungs as well as deaths from direct strikes.
5. Unavoidable impact to plants during construction and the introduction of invasive plant species.
6. Permanent scarring to the landscape leaving an "industrial" look to the area.

Impacts to Cultural Resources of ABDSP:

P51-03

1. Visual impacts to the newly designated Cultural Preserve at Piedras Grandes, just west of Ocotillo and its "sacred site."
2. No adequate accounting for impacts to the multiple cultural resources of the area when viewed as a cultural landscape.
3. Cultural Studies not completed prior to assessing impacts.

Other Potential Impacts

P51-04

1. Substantial increase in noise levels from the operation of the turbines, especially at night in surrounding areas.
2. Impacts to air quality from truck traffic and from concrete batch plants.
3. Increased risk of wildfire hazards.
4. Loss of soil's ability to absorb carbon from scraping.
5. Degradation to the recreational and natural experience of ABDSP by the sight of the turbines and associated facilities.
6. Loss of dark night skies.
7. Degradation of wilderness character of the several BLM wildernesses surrounding the proposed project.

Furthermore, I am greatly disturbed by the seemingly disregard of NEPA requirements in the draft of the EIS. Specifically, I am referring to the fact that it *lacks a full range of alternatives*, namely, the alternative of producing renewable energy on rooftops in the cities where the energy is used. **P51-05**

It is my understanding that your office is mandated to consider viable alternatives that could meet the "need" for the project that lie outside of lands within their jurisdiction.

In closing, I would like to state that this project is not needed. Local rooftop and local distributed renewable energy generation could power the 140,000 homes that this project is slated to power. I urge you to adopt the no-project alternative and protect 12,000 acres of intact desert habitat from destruction for private profit on a project that will be de-commissioned in 30 years.

P51-05, cont.

Please give consideration to the effects the damage will have; do not allow senseless destruction of one of the few treasures that remain in southern California.

Sincerely,

Linda Foote
PO Box 705
Mendocino, CA
95460

Perry, Cedric C

From: Dave <dave828@charter.net>
Sent: Sunday, October 02, 2011 9:24 PM
To: Perry, Cedric C
Subject: Wind farm in the Anza-Borrego Desert State Par

Categories: Ocotillo Exp.

Mr. Perry,

Please re-consider approving this wind farm proposal... They call it progress? **P52-01**

Dave & Tina Gunall
500 Arapaho St
Ventura, Ca. 93001-4402

Perry, Cedric C

From:	Rick Hamilton <cacticreations@hotmail.com>
Sent:	Monday, September 26, 2011 12:46 PM
To:	Perry, Cedric C
Cc:	David Andreoli; Jack Terrazas; Angelina Havens; Juanita Salas
Subject:	Ocotillo Express Comments
Attachments:	BLM EIR.doc
Categories:	Ocotillo Exp.

Please find attached Word document with positive comments about the Wind Turbine project in Ocotillo, CA.

If you can not open document, please call me at 760-214-8044

Thank you and keep up the good work

Rick Hamilton

Rick Hamilton
Cactus Creations
251 W. Imperial Hwy, #51
Ocotillo, CA 92259
760-214-8044
cacticreations@hotmail.com
www.rickscactuscreations.com

September 26, 2011

Mr. Cedric Perry - BLM

I would like to express my appreciation for the meetings you held in El Centro and Ocotillo regarding the Preliminary EIR for the Ocotillo Express wind turbine project. I would like to thank you for not allowing spoken comments at these meetings. From what I was able to tell, most people did not bother to read the EIR's but, instead, just wanted to restate opinions rather than respond to the facts of the reports. As a full-time resident of Ocotillo and property owner since 1981, I do not need any more opinions by either residents or non-residents. **P53-01**

After reading the EIR, it is abundantly clear that a high degree of professional research, study and analysis went into the document to answer both the questions that were brought up in the initial EIR scoping meetings and others questions as required for a project of this magnitude effecting so many varied interest and areas. While I am not well experienced with EIR's, I have read a few and am very impressed by the amount of work that went into this project and the number of mitigating actions willing to be undertaken by Pattern Energy. **P53-02**

I do not recall SDG&E, or Granite or ValRoc or Plaster City being willing to do anything for the community of Ocotillo except rejoice when they were finally through with us or just ignoring our needs. While there is nothing that can be done to change the fact that the area will have a more industrial look, at least Pattern is willing to recognize this and try to do something for the community, as well as have prepared an excellent EIR and agreed to state of the art mitigation measures which would insure their operations have the minimal effects on our environment. **P53-03**

I don't need to take up your time with stating and restating the excellent and compelling reasons for a transition from coal/oil energy generation to renewables. I have been off the power grid since 1983 and am still off the grid using solar cells and am doing quite well in power usage and having a low impact on the desert around me. Part of my ability to be comfortable with my power usage in the fact that is has very low impact on my surroundings. Make no mistake, we, as humans, are the top of the food chain and we can do as we wish with our surrounding but if we don't have to change the earth solely for our use, why do so? Witness Mexico, it is a lot cheaper and easier to build coal/oil fired electrical generating facilities than use renewables. And then sell the power to the USA! What's wrong with this picture? We, the USA, should be leaders not followers in maintaining the environment for all to use. **P53-04**

I believe this is one of the major reasons you should approve the project as it stands. The great majority of our citizens refuse to do without electricity and in generating our requirements we can do nothing and leave the "Greenhouse" earth to our descendants or we can reduce greenhouse gas. Please recognize the needs of the many verses the wants of the few. **P53-05**

Richard Hamilton
251-B Imperial Hwy.
Ocotillo, CA 92259
cacticreations@hotmail.com
760-214-8044

Comment Letter P54

Perry, Cedric C

From: Mary Harte <melharte@yahoo.com>
Sent: Thursday, September 29, 2011 10:23 AM
To: Perry, Cedric C
Subject: Please Stop the Ocotillo Wind Turbine Project!

Categories: Ocotillo Exp.

Dear Mr. Perry,

I am a BIG supporter of clean renewable energy (see my websites below), but there is a right and wrong way to go about providing it. The Ocotillo project is a good example of the wrong way. Its devastating impacts include: **P54-01**

Impacts to Natural Resources of Anza-Borrego Desert State Park (ABDSP): **P54-02**

1. Disruption of wildlife corridors for desert bighorn sheep.
2. Adverse effects to golden eagles due to the birds striking the turbines.
3. Adverse impacts to burrowing owls, long-eared owls, Vaux's swift, peregrine falcons, flat-tailed horned lizards, barefoot geckos, Red diamond rattlesnakes, American badgers, and several listed plant species.
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Impacts to Cultural Resources of ABDSP: **P54-03**

1. Visual impacts to the newly designated Cultural Preserve at Piedras Grandes, just west of Ocotillo and its "sacred site."
2. No adequate accounting for impacts to the multiple cultural resources of the area when viewed as a cultural landscape.
3. Cultural Studies not completed prior to assessing impacts.

Other Potential Impacts **P54-04**

1. Substantial increase in noise levels from the operation of the turbines, especially at night in surrounding areas.
2. Impacts to air quality from truck traffic and from concrete batch plants.
3. Increased risk of wildfire hazards.
4. Loss of soil's ability to absorb carbon from scraping.
5. Degradation to the recreational and natural experience of ABDSP by the sight of the turbines and associated facilities.
6. Loss of dark night skies.
7. Degradation of wilderness character of the several BLM wildernesses surrounding the proposed project.

The NEPA (Environmental Protection Agency) Document does not include an alternative for production of renewable energy at point of use in cities and thus the Draft EIR/EIS is incomplete. **P54-05**

Please adopt the "no project" alternative and protect this important desert habitat from

devastation by private industry for private profit!

Letters are extremely important RIGHT NOW. Please personalize your letter, adding your own experiences of the area and what the loss of this area would mean to you personally.

P54-05, cont.

The draft EIS (Environmental Impact Study) does not meet NEPA requirements because it *lacks a full range of alternatives*, namely, the alternative of producing renewable energy on rooftops in the cities where the energy is used. The BLM (Bureau of Land Management) should adopt a "no-project" alternative. The BLM is mandated to consider viable alternatives that could meet the "need" for the project that lie outside of lands within their jurisdiction.

This project is not needed. Local rooftop and local distributed renewable energy generation could power the 140,000 homes that this project is slated to power. **Adopt the no-project alternative and protect 12,000 acres of intact desert habitat from destruction for private profit on a project that will be de-commissioned in 30 years!** If this project goes through, there will be irreparable damage to the landscape.

There are better places to site such wind projects; our treasured parks and their vicinities are not appropriate.

Cheers,

Mel (Mary Ellen) Harte, Ph. D.

Listen to the daily Climate Change Report at: www.CoolTheEarth.US/climate-report.php
Current news on the consequences of, and solutions to climate change.
Learn about climate change & its solutions through a free downloadable book at: www.CoolTheEarth.US

Perry, Cedric C

From:	Helen Davis <helen@netidea.com>
Sent:	Sunday, October 02, 2011 12:26 PM
To:	Perry, Cedric C
Subject:	wind turbines near Ocotillo
Categories:	Ocotillo Exp.

Mr. Perry,

I first visited Anza Borrego Desert State Park in 1999 and have since returned yearly to explore and enjoy this magnificent wilderness area. For the past 5 years I have gladly volunteered hundreds of hours at the Park Visitor Center and as a naturalist guide for other visitors. I love the desert and I love the Park.

I have recently learned of a proposed wind turbine project adjacent to the southern boundary of the Park. This would have an extremely detrimental visual and aural impact . As well, it would be a hazard to migrating birds, and the necessary transmission lines would have a hugely negative effect along
its route. Although the proposal is sited outside of park
boundaries, the effect would be similar to building a stockyard and slaughterhouse next to the Louvre. Anza Borrego Desert State Park is an invaluable California state treasure and should not be compromised for such mercenary purposes.

California, and the rest of North America, has come to expect unlimited power on demand. But, there IS a limit and we have reached it. Conservation measures as well as rooftop solar installations are the solutions to be pursued at this point. Wilderness is finite. It must be preserved. We owe that much, at least, to future generations. **P55-01**

Daniel Hellyer
State Park Volunteer

Comment Letter P56

Perry, Cedric C

From: Ann Howell <ann.howell@verizon.net>
Sent: Thursday, September 29, 2011 9:41 AM
To: Perry, Cedric C
Subject: Ocotillo Express Wind Turbine Project
Attachments: BorregoOEWTP.pdf; ATT00001.txt

Categories: Ocotillo Exp.

Dear Mr. Perry,

We strongly oppose this project and seek your help in making sure that our beautiful dessert community is not destroyed. Please see letter attached.

Thank you,
Ann Howell

Comment Letter P56

ATTN: Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

RE: Ocotillo Express Wind Turbine Project

As residents of Riverside County, CA, my family has enjoyed the pristine solitude of the local Anza-Borrego dessert community for many years. We are strongly opposed to this project - it is not needed. Local rooftop and local distributed renewable energy generation could power the 140,000 homes that this project is slated to power.

P56-01

Please Adopt the no-project alternative and protect 12,000 acres of intact desert habitat from destruction for private profit on a project that will be de-commissioned in 30 years! If this project goes through, there will be irreparable damage to the landscape.

P56-02

Ann Howell

Ann Howell
26400 Rio Vista Drive,
Hemet, CA 92544
(951) 927-0441

cc: State Clearinghouse

Perry, Cedric C

From:	Randolph C. Houts <rhouts@gmail.com>
Sent:	Thursday, September 29, 2011 8:57 AM
To:	Perry, Cedric C
Subject:	Ocotillo Windmills -
Categories:	Ocotillo Exp.

Mr. Perry,

I would like to express my strong opposition to the BLM permitting windmills near Ocotillo. This area is not some wasteland to clutter up with inefficient power generation facilities. There are plenty of other ways California can generate electricity if environmental restrictions were reasonably eased and the political will would be exercised. I don't believe windmills are low impact, they are just more politically popular with some. I also know from my practice back in the 80's when this sort of thing was tried and failed that these windmills represent a risk when they malfunction, and it's far from clear if they are justified economically in the long run. **P57-01**

This is an area that my family and many others have enjoyed for decades, hiking, horseback riding, jeeping, and camping. Would you put these where you could see them? Would you put them in your favorite outdoor spot? I think not. The desert is always at risk of being treated as a wasteland instead of the teaming source of life and pristine beauty that it is for those with time to experience and learn about it. **P57-02**

I really don't understand how the BLM and other government agencies are working these days. All I hear about is new sections of the out of doors being closed off from use, progressively, inexorably. No vehicles here, no shooting there, no access here. Of course, it's o.k. to lay waste to the appearance of public lands by covering it with these propellerhead monstrosities because the government can say it's doing something green and some commercial interest wants to make money. California needs power generation, certainly but not like this. Build some nuclear plants, build reservoirs to catch water, consider hydro-electrics. Sure those things cover some land and might affect the snail darter or somesuch but they don't make large swaths of the countryside look like a space station on Mars like a windmill farm does. The BLM and other governmental departments need to rediscover their obligation to provide, not lecture about conservation and wall off or deface our public lands. I hope you'll be part of the new paradigm that can bring California government back to its proper role, starting with stopping this project. **P57-03**

Thanks for taking a moment to consider this letter.

Regards,

Randolph C. Houts
Houts and Associates
771 Jamacha Road #527
El Cajon, CA 92019
619-401-2215
rhouts@gmail.com

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Comment Letter P58

Perry, Cedric C

From:	Brendan Hughes <jesusthedude@hotmail.com>
Sent:	Sunday, October 02, 2011 6:27 PM
To:	Perry, Cedric C
Cc:	angelinahavens@co.imperial.ca.us
Subject:	Comments on the Ocotillo Express Wind Project Draft EIR/EIS
Categories:	Ocotillo Exp.

To whom it may concern:

My name is Brendan Hughes and I would like to comment on the proposed Ocotillo Express Wind Project. I have several concerns with the project. First, it would devastate vital habitat for the Endangered Peninsular bighorn sheep, and the flat-tailed horned lizard, which is a perennial candidate for listing under the Endangered Species Act. Also, it would add significantly to the cumulative impact on the above species from other energy and agricultural projects in the area. It would pose a serious threat of injury and death to golden eagles and other raptors known to live in the area, as well as the LeConte's thrasher, burrowing owls, several other sensitive bird species, and as many as twelve species of bats. It would forever alter the wild character of the southern parts of Anza-Borrego Desert State Park and the Jacumba Wilderness Area, destroying their recreational and scenic qualities. Additionally, the proposed project would desecrate ancient Native cultural sites in the the Yuha Desert cultural area, and interfere with the work of the soon-to-be-opened Imperial County Desert Museum. Moreover, it would turn the town of Ocotillo from a quiet, bucolic desert refuge to an industrial zone full of deafening noise 24 hours a day. The project would illegally alter the landscape surrounding the protected Juan Bautista de Anza National Historic Trail. Finally, it would devastate those parts of Imperial County's economy that depend on tourism in the unspoiled desert.

P58-01

In addition, the Draft EIR/EIS is deficient because it does not include a "Distributed Generation" alternative and because public comment was shortchanged due to a truncated "scoping" process.

P58-02

I urge BLM and Imperial County to adopt the "no project" alternative, extend the public comment period by at least 30 days, and hold additional public scoping meetings at which public statements would be allowed.

P58-03

Thank you for your consideration.

Brendan Hughes
61093 Prescott Trail
Joshua Tree, CA 92252

Perry, Cedric C

From: Jerry Hughes <jerrymhughes@gmail.com>
Sent: Wednesday, September 28, 2011 4:55 AM
To: Perry, Cedric C
Subject: Wind turbines next to Anza Borrego Desert State Park

Categories: Ocotillo Exp.

Dear Mr. Perry,

I'm writing in opposition to the proposed wind turbine farm that may be constructed next to Anza-Borrego Desert State Park. Not only is this farm not needed, I strongly disagree with this public, BLM land being used for a private company's profits! If this company wants to construct a wind farm, it should seek privately owned land to buy or rent and not public land. **P59-01**

Not only is the farm not needed, its location next to Anza-Borrego Desert State Park is another, major factor in considering its construction. Wild places, like the park, are extremely rare, especially in southern California. Installing wind turbines next to such a wild place is just one more assault upon the few places where southern California residents can escape to, to enjoy what little of that that we have left. **P59-02**

I urge you to reject this project----- for the good of all southern California residents who cherish public land in its untouched state. **P59-03**

Respectfully,

Jerry Hughes
2810 Union St. #14
San Diego, Ca. 92103.

Perry, Cedric C

From:	pam <professor_pam@yahoo.com>
Sent:	Wednesday, September 28, 2011 11:19 PM
To:	Perry, Cedric C
Subject:	Ocotillo Wind Energy Facility
Categories:	Ocotillo Exp.

I am writing this email because I am against the proposed Ocotillo Wind Energy Facility. I feel that its presence would disrupt the natural environment and can harm the wildlife in the area. **P60-01**

Sincerely,
Dr. Pam Kersey
http://ultimatehike.org/pamelak

Perry, Cedric C

From:	James Knotter <jim.knotter@gmail.com>
Sent:	Thursday, September 29, 2011 8:38 AM
To:	Perry, Cedric C
Subject:	Ocotillo Wind Farm
Categories:	Ocotillo Exp.

Dear Mr. Perry:
I strongly oppose the Ocotillo Wind Farm proposal and urge you to withhold approval. The desert vistas afforded by the land under your management must not be impaired by commercial developments such as this. The only justification is the utilities' desire to exploit our natural resources for their own profit. This power generated by these windmills should be produced at the sites where it is used, for example solar panels on homes and businesses. By doing so, the need for projects like this one, as well as the Sunrise Power Link, would be met without degradation of our priceless and irreplaceable natural resources. **P61-01**
Please do not let this project go forward.
Thank you for your stewardship.
James Knotter
San Diego, CA

Comment Letter P62

Conrad Kramer
Lisa A. Gonzales-Kramer
P.O. Box 1110
Borrego Springs, CA 92004
October 2, 2011

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

RE: Ocotillo Wind Energy Facility

Dear Mr. Perry:

I have been dreaming of green energy my entire life and so have many of my generation who were born in the 60s. Please don't approve this project that makes a mockery of our dreams. Renewable energy in our region must take the form of solar panels on rooftops, over parking lots or at least over disturbed land. **P62-01**

This huge development is a death knell to the dream of clean energy and gives rise to such oxymorons as renewable energy carbon footprint and green energy's ecological damage. This project will cause extensive damage to some of the most fragile and wild ecosystems in the nation and would mar the view shed of Anza-Borrego Desert State Park from many overlooks that are popular with hikers in the park. And the famed experience of the desert, the silence, the darkness, and wide vistas would be forever changed in lands that directly border wilderness designated areas. **P62-02**

All the experts that work a the Park agree that the ecological damage of this project would be huge to the endangered Peninsular Big Horn sheep, the strikes with eagles, hawks and owls, and bats would be significant. And many ground animals would die on the miles of dirt roads. **P62-03**

Please don't approve this project. Let the greening of American power happen in a green way. Please, hold the line on a better future for all of us, a sustainable future, the one we've all been dreaming of. **P62-04**

Sincerely,

Conrad Kramer

Lisa A.Gonzales-Kramer

Perry, Cedric C

From: Kevin K <kevk_la@yahoo.com>
Sent: Thursday, September 29, 2011 12:26 AM
To: Perry, Cedric C

Categories: Ocotillo Exp.

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Mr. Perry,

I am writing to lodge my strong opposition to the proposed Ocotillo Wind Energy Facility. I have been visiting Anza-Borrego California State Park since I was first introduced to it in 1979. I immediately fell in love with its peace and serenity and have been returning to it almost every year since. **P63-01**

I have seen the proposed OWEF wind tower locations and it strikes me as wholly inappropriate to the overarching goal of protecting this fragile desert environment. These towers would not only shatter areas of the Anza-Borrego Park viewshed but would also disrupt plant and animal life in a wide area around it. This is not a reasonable trade-off. **P63-02**

There are better alternatives available such as distributed green power (rooftop solar panels) that would generate equivalent amounts of energy without inflicting damage on the environment. **P63-03**

Sincerely,

Kevin Kraus
3417 Grand View Bl
Los Angeles, CA 90066
310 439-1444

Perry, Cedric C

From:	Ray Kumli <raykumli@sonic.net>
Sent:	Thursday, September 29, 2011 5:18 PM
To:	Perry, Cedric C
Subject:	Proposed Ocotillo Express Wind Turbine Project
Categories:	Ocotillo Exp.

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
Dear Mr. Perry:

I am writing to express my concern regarding the proposed "wind farm" in the Ocotillo area adjacent to Anza Borrego State Park. While alternative energy is an important goal, the scope and size of this project will have a disastrous effect on the entire region. This a pristine area enjoyed by many people as a respite from hectic and stressful lives. My wife and I have spent time in Borrego over the last eight years and plan to be there for at least two months next year. The renderings of this project conjure up the area one reaches when driving to Palm Springs, a blight on the landscape. It would seem to me that a significant solar project would be more appropriate for the area and probably more cost effective.

I sincerely hope and request that this project be turned down.

P64-01

Sincerely

Ray Kumli
732 Austin Way
Sonoma, CA 95476

Comment Letter P65

Dr. Gerald A. Lieberman
13648 Jackrabbit Road
Poway, California 92064

(858) 487-2551 (phone)
(858) 676-1088 (fax)
gerald@seer.org (e-mail)

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov

re: proposed Ocotillo Wind Energy Facility

Mr. Perry:

As a concerned citizen and professional biologist who has studied and enjoyed the Anza-Borrego Desert for more than 30 years, I request that the BLM adopt the "no project" alternative for the proposed Ocotillo Wind Energy Facility. This area represents an important desert habitat not only ecologically but because of its ease of access from several major urban areas and its visitation by thousands of U.S. and foreign tourists each year. **P65-01**

I strongly support renewable energy but there are better locations for a project such as this that would result in fewer environmental impacts. Please consider alternatives to this project, perhaps on land other than that belonging to the BLM, to limit the impacts on wildlife, the viewshed of Anza-Borrego Desert State Park, the nearby cultural sites, and overall ecosystem continuity. **P65-02**

Thank you.

Perry, Cedric C

From: Diana Lindsay <dlindsay@sunbeltpub.com>
Sent: Thursday, September 29, 2011 4:24 PM
To: Perry, Cedric C
Subject: Ocotillo Wind Energy Facility letter
Attachments: Ocotillo Wind Energy Facility letter 9-29-11.pdf

Categories: Ocotillo Exp.

Please send confirmation that you received my letter. Thank you – Diana Lindsay

Diana Lindsay, President
Sunbelt Publications
1256 Fayette Street
El Cajon, CA 92020
619-258-4905 x 104
dlindsay@sunbeltpub.com

September 29, 2011

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

SUBJECT: Proposed Ocotillo Wind Energy Facility

Dear Mr. Perry,

I want to express my concern about the proposed Ocotillo Wind Energy Facility that, if constructed, would be directly adja Anza-Borrego Desert State Park, to the east of the community of Ocotillo, California. Although I recognize the need for the devel of alternate energy sources, such as wind and solar, I believe it is prudent to consider the impacts of those developments on the surrounding landscape in addition to the real need for the construction of such facilities. In this particular case, I can not see the justification for construction, considering the impacts and alternate sources of energy that are possible.

This facility, if built, would impact 12,436 acres, blighting the view shed of Anza-Borrego Desert State Park in many key a the southern section of the park. There would be devastating impacts to biological and cultural resources. Of high concern are imp air quality, possible climatic disturbances, and degradation of the "desert experience" through noise, night light pollution, and a ge industrial feel to areas adjacent to state wilderness areas.

More importantly, the impact to the desert will only produce power for up to 140,000 homes, power that could be available those homes through construction of solar panels closer to the needed sources of power. I further understand that this project has a of 30 years. That seems very short-sighted when considering the irreparable damage done to the desert landscape that will never be same once it is destroyed. One generation's greed for power will inhibit many generations from enjoying this desert landscape and as a source of recreation and "re-creation" in a fast-paced world.

I am a guidebook author. My husband and I wrote the *Anza-Borrego Desert Region: A Guide to the State Park and Adjace* (Wilderness Press). Our guide has been the "bible" for this desert area for more than 25 years, and it is now in its 5th edition. We k park. We know how important this park is to so many people – hundreds of thousands of people, many more than the number of p that this wind energy facility will benefit for a relatively short period of time.

My other concern is the whole process involved in seeking approval for this facility. It appears that the draft EIS does not n NEPA requirements because it lacks a full range of alternatives, including alternative of producing renewable energy on rooftops w the energy will be used. I am not seeing an alternative listed for "no-project." I believe that the process should include the possibili NOT approving the process if impacts and necessity for the project do not meet minimum standards. Perhaps the BLM should cons other viable alternatives that lie outside of lands within the BLM's jurisdiction?

I would urge you to adopt a "no-project" alternative and protect desert habitat from this devastation and potential eye-sore. the wrong location for such a project when all factors are considered.

Sincerely,

Diana Lindsay, President
619-258-4905 x 104
dlindsay@sunbeltpub.com

cc: State Clearinghouse – 916-323-3018
Imperial County Board of Supervisors

Comment Letter P66

SUNBELT PUBLICATIONS, INC.
Outdoor Adventure, Natural History, Regional Interest

September 29, 2011

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

SUBJECT: Proposed Ocotillo Wind Energy Facility

Dear Mr. Perry,

I want to express my concern about the proposed Ocotillo Wind Energy Facility that, if constructed, would be directly adjacent to Anza-Borrego Desert State Park, to the east of the community of Ocotillo, California. Although I recognize the need for the development of alternate energy sources, such as wind and solar, I believe it is prudent to consider the impacts of those developments on the surrounding landscape in addition to the real need for the construction of such facilities. In this particular case, I can not see the justification for construction, considering the impacts and alternate sources of energy that are possible.

P66-01

This facility, if built, would impact 12,436 acres, blighting the view shed of Anza-Borrego Desert State Park in many key areas of the southern section of the park. There would be devastating impacts to biological and cultural resources. Of high concern are impacts to air quality, possible climatic disturbances, and degradation of the "desert experience" through noise, night light pollution, and a general industrial feel to areas adjacent to state wilderness areas.

P66-02

More importantly, the impact to the desert will only produce power for up to 140,000 homes, power that could be available to those homes through construction of solar panels closer to the needed sources of power. I further understand that this project has a lifespan of 30 years. That seems very short-sighted when considering the irreparable damage done to the desert landscape that will never be the same once it is destroyed. One generation's greed for power will inhibit many generations from enjoying this desert landscape and using it as a source of recreation and "re-creation" in a fast-paced world.

P66-03

I am a guidebook author. My husband and I wrote the *Anza-Borrego Desert Region: A Guide to the State Park and Adjacent Areas* (Wilderness Press). Our guide has been the "bible" for this desert area for more than 25 years, and it is now in its 5th edition. We know this park. We know how important this park is to so many people – hundreds of thousands of people, many more than the number of people that this wind energy facility will benefit for a relatively short period of time.

P66-04

My other concern is the whole process involved in seeking approval for this facility. It appears that the draft EIS does not meet NEPA requirements because it lacks a full range of alternatives, including alternative of producing renewable energy on rooftops where the energy will be used. I am not seeing an alternative listed for "no-project." I believe that the process should include the possibility of NOT approving the process if impacts and necessity for the project do not meet minimum standards. Perhaps the BLM should consider other viable alternatives that lie outside of lands within the BLM's jurisdiction?

P66-05

I would urge you to adopt a "no-project" alternative and protect desert habitat from this devastation and potential eye-sore. This is the wrong location for such a project when all factors are considered.

P66-06

Sincerely,

Diana Lindsay

Diana Lindsay, President
619-258-4905 x 104
dlindsay@sunbeltpub.com

cc: State Clearinghouse – 916-323-3018
Imperial County Board of Supervisors

1256 Fayette Street • El Cajon, CA 92020-1511 • (619) 258-4911 • FAX (619) 258-4916
www.sunbeltbooks.com

Perry, Cedric C

From: Jim Liskovec <jsliskovec@earthlink.net>
Sent: Saturday, October 01, 2011 4:22 PM
To: Perry, Cedric C
Subject: Ocotillo Wind Energy Facility

Categories: Ocotillo Exp.

Dear Mr Perry,

We very strongly oppose the proposed Ocotillo Wind Energy Facility.
It will significantly affect Anza Borrego Desert State Park. Wind energy is the right idea. This project is in the wrong place. The environmental impact statement for the project is inadequate. Please adopt the No Project alternative. **P67-01**

We have for over 20 years traveled from Northern California to Anza Borrego Desert State Park. We have hiked the trails and where there are no trails. We have photographed the spring flowers, the desert birds and the sunrises. We have pulled invasive weeds. We have watched thousands of Swainson's Hawks migrate through Borrego Valley.
We have cherished the silence of the desert. This ill-conceived project would have serious negative affects on all the reasons we travel such a long way to enjoy the park. **P67-02**

Sincerely,

Jim and Sue Liskovec
1719 Christina Drive
Los Altos CA 94024

Public Comment Card

Ocotillo Wind Energy Facility

Commentor Name: CARMEN LUCAS Date: 25 AUG 2011

Address: PO BOX 775, PINE VALLEY CA. 91962

Comment: THIS PROCESS IS UNFAIR!! SINCE WHEN HAS THE PUBLIC NOT BEEN ALLOWED FOLLOWING DISAPPROVE THE OCOTILLO WIND EXPRESS PROJECT - IT IS ONE OF MANY PROJECTS THAT COLLECTIVE ARE IN THE PROCESS OF COMPLETELY DESECRATING SOUTHERN CALIFORNIAS ESSENCE OF PLACE. P68-01

CONSULTATION WITH NATIVE AMERICANS HAS NOT BEEN COMPLETED BEFORE THESE PROJECTS CREATED THERE DRAFT EIR - THE ARCHAEOLOGICAL REPORT WAS NOT COMPLETED PRIOR TO DRAFT EIR - ARCHEOLOGIST DO NOT INCLUDE THE NATIVE AMERICANS VALUES AND UNDERSTANDING OF THE ENTIRE LANDSCAPE AND THE PROPOSED IMPACTS OF THE ENTIRE SOUTHERN CALIF LANDSCAPE WILL SUFFER FROM CONSTRUCTION DEVELOPMENT PROCESS - P68-02

CRUST OF THE DESERT FLOOR WILL BE IMPACTED BY EACH SITE TO EACH TOWER. WILL THIS CREATE A DUST BOWL EFFECT. P68-03

ITS THE ENTIRE LANDSCAPE AS A WHOLE NOT LITTLE CIRCLES THAT ARE AT THE HEART OF MY CONCERNS. P68-04

By submitting a scoping comment you will receive a copy of the EIS. Please indicate the format you would prefer:

☐ Compact Disk (CD) or ☒ Hardcopy

Perry, Cedric C

From:	Cornelia Lundell <lieblundell@sbcglobal.net>
Sent:	Thursday, September 29, 2011 10:31 PM
To:	Perry, Cedric C
Subject:	Ocotillo Wind energy Project
Categories:	Ocotillo Exp.

Attention Cedric Perry:
Here is my request related to the Wind energy project. While not opposed to developing wind energy I nevertherless oppose thid project and therfore request that you support the **Adoption of the no-project alternative and protect 12,000 acres of intact desert habitat from destruction for private profit on a project that will after all be de-commissioned in 30 years after desroying this precious habitat! I have been a member of Anza-Borrego for years and treasure this unique state park.** **P69-01**

Cornelia Lieb-Lundell PT,DPT,PCS
La Jolla CA 92037
858 459 7338

Perry, Cedric C

From:	anita mallin <mallinprop@charter.net>
Sent:	Thursday, September 29, 2011 1:16 PM
To:	Perry, Cedric C
Subject:	FW: wind farms in Anza or any where else
Categories:	Ocotillo Exp.

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov

With a FAX copy to the State Clearinghouse: 916-323-3018

From: anita mallin [mailto:mallinprop@charter.net]
Sent: Thursday, September 29, 2011 1:14 PM
To: 'cperry@blm.gov'
Subject: wind farms in Anza or any where else

I am opposed to any alternative energy including wind farms if there is 1 government dollar involved. These monstrosities would never be built if building them required private entities to buy the land and invest their own monies in the equipment. Shall we start taking about Solyndra? Light squared? All of this administrations investments in alternative or green industries has produced 1 job for every 10.88 million dollars of taxpayers money invested. Stop spending money you do not have on investments that will not produce either jobs or a return of our taxpayer dollars. **P70-01**

Anita Mallin
1amallin@charter.net
Long Beach, ca 90814

Perry, Cedric C

From:	scot martin <smartinized@gmail.com>
Sent:	Saturday, October 01, 2011 9:42 AM
To:	Perry, Cedric C
Subject:	Public Comment on Ocotillo Express Wind Turbine Project
Attachments:	Letter to BLM concerning Oct Exp.docx
Categories:	Ocotillo Exp.

Scot Martin

PO Box 1549

Borrego Springs, CA 92004

October 1, 2011

Mr. Cedric Perry

California Desert District Office

Bureau of Land Management

22835 Calle San Juan De Los Lagos

Moreno Valley, CA 92553

cperry@blm.gov

RE: Public Comments Concerning the Ocotillo Express Wind Turbine Project

Dear Mr. Perry and the Bureau of Land Management:

Please accept this letter as my strongest opposition to the proposed Ocotillo Express Wind Project. I urge you and the BLM to adopt the "no project" alternative for the following reasons:

First the Draft EIR/EIS failed to address significant impacts to Anza-Borrego Desert State Park. This is a huge oversight to have ignored impacts to an important neighbor that the people of California have determined to be worth the highest levels of protection for its endangered and threatened wildlife, important cultural landscape, vast unmarred viewsheds and soul searching solitude. This proposed debacle not only abuts ABDSP but also designated State Wilderness. And what of the Federal Wilderness areas that will have significant impacts to viewsheds surrounding this travesty of a proposal?

What will the public gain if the BLM allows this wind turbine project to be built? It will NOT give the public cheap, reasonable or reliable electricity. It WILL further our reliance on large corporations to provide for us. It WILL destroy desert view sheds, solitude and recreational opportunities for us and future generations. It WILL destroy habitat for wildlife and endangered species. It WILL result in a loss of wildlife corridors and movement oportunities. It WILL kill migratory birds and bats. It WILL negatively impact the movements of Peninsular bighorn sheep. Regardless of the findings of the Draft EIR/EIS these impacts cannot be adequately mitigated. In the case of the wildlife (including the federally listed flat tailed horned lizard, Golden Eagle and Peninsular bighorn sheep), cultural sites and viewsheds you do not simply come back in 30 years and put it back the way it was. For the creatures that live within the 13,000 acres that IS their home and we MUST respect that! This project WILL only benefit one corporation, Pattern Energy, who will sell the energy at a profit to us, the public that collectively owns the land.

The impression throughout this process is that BLM is working closely with Pattern Energy, with utter disregard for the concerns of the people, the land and its inhabitants or natural and cultural resources, all of which are elements of the mission statement of the BLM. As an example, the Draft EIR/EIS does not address an alternative for production of renewable energy at point of use such as roof top solar. Therefore, **I implore the BLM to adopt the "no project" alternative**. Please restore the public's faith in our federal agencies to administer and manage public lands for all Americans and not just a few for profit groups.

Sincerely,

Scot Martin

Scot Martin
PO Box 1549
Borrego Springs, CA 92004

October 1, 2011

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov

RE: Public Comments Concerning the Ocotillo Express Wind Turbine Project

Dear Mr. Perry and the Bureau of Land Management:

Please accept this letter as my strongest opposition to the proposed Ocotillo Express Wind Project. I urge you and the BLM to adopt the "no project" alternative for the following reasons:

First the Draft EIR/EIS failed to address significant impacts to Anza-Borrego Desert State Park. This is a huge oversight to have ignored impacts to an important neighbor that the people of California have determined to be worth the highest levels of protection for its endangered and threatened wildlife, important cultural landscape, vast unmarred viewsheds and soul searching solitude. This proposed debacle not only abuts ABDSP but also designated State Wilderness. And what of the Federal Wilderness areas that will have significant impacts to viewsheds surrounding this travesty of a proposal? **P71-01**

What will the public gain if the BLM allows this wind turbine project to be built? It will NOT give the public cheap, reasonable or reliable electricity. It WILL further our reliance on large corporations to provide for us. It WILL destroy desert view sheds, solitude and recreational opportunities for us and future generations. It WILL destroy habitat for wildlife and endangered species. It WILL result in a loss of wildlife corridors and movement oportunities. It WILL kill migratory birds and bats. It WILL negatively impact the movements of Peninsular bighorn sheep. Regardless of the findings of the Draft EIR/EIS these impacts cannot be adequately mitigated. In the case of the wildlife (including the federally listed flat tailed horned lizard, Golden Eagle and Peninsular bighorn sheep), cultural sites and viewsheds you do not simply come back in 30 years and put it back the way it was. For the creatures that live within the 13,000 acres that IS their home and we MUST respect that! This project WILL only benefit one corporation, Pattern Energy, who will sell the energy at a profit to us, the public that collectively owns the land. **P71-02**

The impression throughout this process is that BLM is working closely with Pattern Energy, with utter disregard for the concerns of the people, the land and its inhabitants or natural and cultural resources, all of which are elements of the mission statement of the BLM. As an example, the Draft EIR/EIS does not address an alternative for production of renewable energy at point of use such as roof top solar. Therefore, **I implore the BLM to adopt the "no project" alternative.** Please restore the public's faith in our federal agencies to administer and manage public lands for all Americans and not just a few for profit groups. **P71-03**

Sincerely,

Scot Martin

Comment Letter P72

Perry, Cedric C

From: Susan Massey <susanlil_8@yahoo.com>
Sent: Tuesday, August 30, 2011 10:38 AM
To: Perry, Cedric C
Cc: deserthamon@gmail.com; terryweiner@sbcglobal.net; atomictoadranch@netzero.net
Subject: meetings on Ocotillo Wind Express

Categories: Ocotillo Exp.

Dear Mr. Perry:

I am an Imperial County resident and I attended the meetings regarding the Ocotillo Wind Express Energy Project that were held in Imperial County on August 24 and 25. I was very disappointed that the public did not have a chance to comment for the record or to ask questions which would be answered by the entire group. I understand that this is established practice for projects planned for public lands and **request that other meetings be held in Imperial County during which the public is given the opportunity to comment for the record.** **P72-01**

For desert lovers, the Ocotillo area is really the jewel of the Imperial Valley, filled with biodiversity. Below you will see a picture taken along Imperial Highway on April 5, 2010, right in the area where the wind turbines will be buillt. I am also very worried about the affects on the health of my friends who live in Ocotillo. They are all senior citizens and already suffer from diverse ailments. **P72-02**

Sincerely,
Susan Massey
817 E. 7th Street
Holtville, CA
760-356-5649

Perry, Cedric C

From: K.J. McNabb <happymedeyum@yahoo.com>
Sent: Thursday, September 29, 2011 6:35 PM
To: Perry, Cedric C
Cc: info@theabf.org
Subject: Ocotillo Express Wind Turbine Project

Categories: Ocotillo Exp.

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Mr. Perry,

I live in Wisconsin, and have for the past 14 years. So why would I be concerned about the fate of a small desert state park in Southern California? Perhaps the fact that I am concerned enough to write this letter will be reason enough for you to read on.

Anza-Borrego Desert State Park is truly a jewel in the rough. And it's the rough that makes it so special. I moved to San Diego from the Midwest when I was 20 years old, got married, gave birth to and raised my two boys there. Like a lot of young couples, we didn't have a lot of money but we did have a vast appreciation of nature and wanted to pass that on to our children. We taught them the importance low-impact wilderness camping while discovering the unbelievable variety of the park's flora and fauna. We spent many a clear, silent night camping under infinite stars in this beautiful park. P73-01

I am not a religious person, but one of my clearest, and dearest, memories is looking out from a hilltop over Blair Valley. The air was perfectly still. The sky was brilliant, clear and vivid blue. I felt my existence diminish with the realization that I was just an infinitesimal spec in the grand scheme of things. I literally felt my soul lighten as I gave thanks for this truly sacred space. That moment continues to have a profound effect on my life and I continue to be contributor and visitor to the ABDSP.

So now I arrive at the purpose for my letter. It is my understanding the EIS for the Ocotillo Express Wind Turbine Project does not meet NEPA requirements because it lacks a full range of alternatives. So I am writing to ask that the BLM adopt a "no-project" alternative since the BLM is mandated to consider viable alternatives that could meet the "need" for projects that lie outside of lands within their jurisdiction. I believe this is necessary to keep the proposed Ocotillo Express Wind Turbine Project from destroying what I, and many others, consider to be a sacred and pristine place. There are so few of these spaces left in our damaged world. Too much has been sacrificed for our thoughtless consumption of energy and soon there will be nothing left that can instill the wonder and awe that these wild places create within each of us. P73-02

Please take the time to think outside of "what is" and consider instead "what if?" P73-03

Thank you for your time.

With sincere regards,

Kym J. McNabb
Monticello, Wisconsin

Mr. Cedric Perry, Project Manager
U. S. Bureau of Land Management
22835 Calle San Juan de Los Lagos
Moreno Valley, CA 92553

Mark Jorgensen
P.O. Box 7
Borrego Springs, CA 92004
September 22, 2011

SUBJECT: Draft DEIS, OCOTILLO EXPRESS WIND PROJECT Mr. Cedric Perry:

Thank you for the opportunity to voice my deep concerns on the Ocotillo Express Wind Turbine Project, proposed by BLM and Pattern Energy.

I recently retired as the Superintendent of Anza-Borrego Desert State Park. I worked for State Parks at Anza-Borrego since 1972, studying desert bighorn sheep, working as a State Park Ranger, Park Naturalist, Resource Ecologist, Environmental Scientist, and for the last eight years of my career, the Park Superintendent.

I am astounded the Ocotillo Express Wind Project has been proposed in this location, with total disregard for the natural and cultural resources of our desert.

BLM has the mandate to protect our public lands, and in this case I believe your agency has failed us. Under the California Desert Conservation Plan, BLM designated the area as "Limited Use", meaning vehicles are restricted to existing trails. This was determined after years of public input and review. Now, here is a proposal to destroy 13,000 acres of our public lands for a private industrial investment zone. This site will be desecrated, but so will hundreds of thousands of acres of surrounding lands with their viewshed qualities destroyed. **P74-01**

So, we Americans are being asked to give Pattern Energy 13,000 acres of our precious land. Why is BLM advocating for a private company, and not for the protection of lands it's legally obligated to manage? What will we citizens get out of this deal? Discounted electrical rates? Private industry taking over our land, producing energy, and we will be paying some of the highest electrical rates in the Nation, thanks to SDG&E, Pattern Energy, and our own BLM.

I read the environmental impact documents to see how this project would affect the Anza-Borrego Desert State Park, only yards from the project, with a common boundary of more than five miles. What a surprise to find Anza-Borrego's impacts had not even been considered in the development of this proposal. No detailed analysis—not a single Key Observation Point considered for visual impacts! The State Park had to make critical comments on previous drafts in order to have KOP's within the Park analyzed—and then only when the Park staff did all the work. Why did the BLM not consider impacts to the largest State Park in the contiguous United States? What of the newly designated Cultural Preserve at Piedras Grandes, just west of Ocotillo Express? Was there any consideration given to this Sacred Site? What of the wildlife corridors? What of the desert bighorn sheep? **P74-02**

I stood just inside Anza-Borrego Desert State Park and tried to imagine the sea of 450' tall steel towers looming above me. What I saw was an IRON CURTAIN, a massive industrial mega-complex conceived by some money-hungry mongers from another world. BLM sanctions this proposal? **P74-03**

Who is BLM representing here, the citizens of the United States, or Pattern Energy? From what I observed at the "Open House" in Ocotillo, it certainly is clear BLM is a partner of the private developer, Pattern Energy, and not the citizens.

In reading the Wildlife Impacts Section of the Document I considered the impacts to the desert bighorn sheep, which I have studied here since 1967. I found it convenient that the USF&WS had just recently Undesignated a huge swath of Critical Habitat in this region, just in time for the Ocotillo Express to be able to state their project is not within Critical Habitat. So much for the Endangered Species Act. **P74-04**

Mitigation for bighorn sheep? How about NOT building wind turbines within bighorn habitat, or within wildlife movement corridors?

What of the 14 FTHL's observed on-site, which means there are actually many more? What of the golden eagles which use this desert site for foraging ? An average of sixty golden eagles are killed each year at the Altamont Pass Wind Generation site, near San Jose. SIXTY a year!! It takes 10-20% of all the golden eagle nests in CA to supply that sixty birds **P74-05** killed in one wind generator project! What of the CA Condors being restored in N. Baja? One was documented traveling into the US, as far as Cuyamaca and Anza-Borrego. What of the 16 burrowing owls, and the W. Mastiff Bats, both listed as BLM Sensitive Species? BLM should be ashamed of approving this environmental document for public release. **P74-05, cont.**

The analysis results in a wildlife monitoring system to take care of wildlife concerns----So, they're going to monitor the death of countless birds species, monitor all the dead bats, pick up the dead golden eagles, Swainson's hawks, burrowing owls, and peregrine falcons?---at least we'll know how many were killed in this travesty of "Green Energy". I call it RED Energy, for all the bloodshed it will be responsible for. The radar based "early warning system" is a ridiculous excuse for monitoring bird movements in the region, as is the "observation tower staffed by a professional biologist". How can one person stationed in an observation tower possibly watch over 13,000 acres? The observer cannot see birds, even large raptors, from across the project landscape. These are tactics created to appease the critics, rather than provide a measure of safety for wildlife of the area. **P74-06**

About 155 wild turbines are now proposed for this project. According to sources it is estimated that 6-7% of all energy sent into a 500Kv powerline such as the Sunrise Powerlink is lost in transmission. This means that 6% of all the energy generated by the wind turbines will be wasted---their electrical generation lost on the trip to SD---sparking into space, or someone's backyard. Energy generated by nine wind turbines, built at huge expense will be wasted---forever.......How many acres will they cover, how many birds will they kill in their 30 year life?

This is yet another vote for not building Ocotillo Express, and putting the money and energy into rooftop solar power generation where it will be used---in the city. **P74-07**

The "Public Meeting" sponsored in August 2011 in Ocotillo was not really a public meeting, but an "Open House". I received a press release entitled, "Public Meeting". Public testimony was not accepted, or welcome. The BLM staff and representatives of Pattern Energy made it easy on themselves that night, not having to answer questions in public, or having to listen to testimony of the 75 members of the public who were prepared to offer their opinions in the public forum. I found this meeting a waste of my time and gas, in that I drove 170 miles round-trip to attend. We, the members of the public, were offended by this sham of a public meeting. **P74-08**

We moved to this desert because we love it. We fight to protect it.

Energy should be developed in the regions where it will be consumed, not hundreds of miles away and then wastefully transported into the cities.

This project is an insult to us, and I hope this IRON CURTAIN, mega-industrial complex never exists. **P74-09**

Sincerely,

Mark C. Jorgensen, Borrego Springs, CA

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To get off the CONS-CNRCC-DESERT-FORUM list, send email to LISTSERV@LISTS.SIERRACLUB.ORG Make the message text (not the Subject): SIGNOFF CONS-CNRCC-DESERT-FORUM

Perry, Cedric C

From:	marilyn moskowitz <marilynam1948@hotmail.com>
Sent:	Thursday, September 29, 2011 2:24 PM
To:	Perry, Cedric C
Subject:	Proposed Octillo wind energy facility - comments
Categories:	Ocotillo Exp.

Dear, Mr. Perry
California Desert District Office
Bureau of Land Management
Moreno Valley, Ca. 92553

I wish to inform you that I am opposed to the Proposed Octillo Wind energy facility.
It would be located on 12,436 acres on the border of ABDSP,straddling highway S2,. There are negative impacts to the park's wildlife, vistas, and Permeanent
scarring to the landscape resulting in an industrial landscape.
This is a world class park, people come all the way from Germany and other countries to see and experience this place. I spend alot of time hiking and take alot
of out of town guests here to introduce them to the beauty of the desert. My access is through Octillo as I live and work in El Centro.
I value this place its a world class destination and a world class park that California is justly proud of. We must protect this special place.

P75-01

Thank you, for your time and consideration,

Marilyn Moskowitz
1536 W. Elm Ave
El Centro, Ca. 92243

Perry, Cedric C

From:	Edward M. Nolan <emnolan@cox.net>
Sent:	Saturday, October 01, 2011 3:01 PM
To:	Perry, Cedric C
Subject:	Ocotillo Wind Energy Facility
Categories:	Ocotillo Exp.

To:
Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Oct 1, 2011

Dear Mr. Perry;

I am contacting you in regards to the planned **Ocotillo Wind Energy Facility** that is proposed just south of Anza Borrego Start Park. I am shocked to hear of such a proposal and strongely urge you to reconsider this project since it would be nothing short of a visual and ecological disaster for the region.

I came to southern California in 1982 and fell in love with Anza Borrego shortly after my arrival. I visit the park very often, and every time I do, I am thrilled to be in such an unspoiled and special desert environment. The thought of constructing wind turbines next to the park, spoiling the beauty of this very important region is simply wrong.

P76-01

I urge you to **please adopt the "no project" alternative and protect this important desert habitat from devastation.**

The southern region of Anza Borrego is particularly special due to its volcanic past and is a favorite photographic subject of mine. My children and I count on you to do the right thing for the future of the park. This project is simply not needed and alternative sources of energy and locations for wind generated energy in particular need to be considered.

P76-02

Sincerely,

Dr. Edward M. Nolan

12105 Wilsey Way

Poway, CA

92016

Perry, Cedric C

From: Tony Palermo <ajpal@me.com>
Sent: Friday, September 30, 2011 11:09 AM
To: Perry, Cedric C
Subject: Proposed Ocotillo Wind Energy Facility

Categories: Ocotillo Exp.

Mr. Perry

Please reconsider the
proposed Ocotillo Wind Energy Facility. The effects to the natural habitat, cultural resources and environment greatly out weigh any benefits from the construction of this facility. In this region, home to family and friends since the 1950's, solar power makes much more sense. There has to be a better way to generate power in an area with so much sun exposure - how about utilizing all of the rooftop space on existing buildings to gather solar power instead of building a wind turbine facility that mars the landscape and endangers wildlife. In most cases I would be an advocate for wind power - but not here. Please turn down the
proposed Ocotillo Wind Energy Facility. P77-01

Thank you

Tony Palermo

Perry, Cedric C

From:	Ruth Porter <ruthmp@sbcglobal.net>
Sent:	Wednesday, September 28, 2011 9:14 PM
To:	Perry, Cedric C
Subject:	Ocotillo Wind Energy Facility
Categories:	Ocotillo Exp.

To: Mr. Cedric Perry

California Desert District Office

Bureau of Land Management

22835 Calle San Juan De Los Lagos

Moreno Valley, CA 92553

Dear Mr. Perry,

The proposed Ocotillo Wind Energy Facility consists of the construction, operation, and maintenance of wind turbines and associated facilities to generate up to 465 MW of electrical energy directly adjacent to Anza-Borrego Desert State Park, within the vicinity of the community of Ocotillo. A proposed total of 155 wind turbines, which would power up to 140,000 homes—each up to 425 feet tall—and up to 42 miles of access roads would be located on 12,436 acres. The project would be located contiguous with the southwestern border of ABDSP, straddling Highway S-2.

I am told the draft EIS does not meet NEPA requirements because it *lacks a full range of alternatives*, namely, the alternative of producing renewable energy on rooftops in the cities where the energy is used. The BLM should adopt a "no-project" alternative. The BLM is mandated to consider viable alternatives that could meet the "need" for the project that lie outside of lands within their jurisdiction. **P78-01**

TI believe this project is not needed. Local rooftop and local distributed renewable energy generation could power the 140,000 homes that this project is slated to power. Adopt the no-project alternative and protect 12,000 acres of intact desert habitat from destruction for private profit on a project that will be de-commissioned in 30 years! If this project goes through, there will be irreparable damage to the landscape. **P78-02**

Please consider stopping this project.

Thank you,

Ruth Porter
resident of Borrego Springs, CA
ruthmp@sbcglobal.net

Perry, Cedric C

From:	Larry_LmPDevco <Larry@LmPDevco.biz>
Sent:	Wednesday, September 28, 2011 10:34 PM
To:	Perry, Cedric C
Subject:	Ocotillo Wind Energy Facility
Categories:	Ocotillo Exp.

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Mr. Perry:

My family has enjoyed the unspoiled beauty of Borrego Springs desert area for years, and I would like my family to continue to enjoy it unspoiled. **P79-01**

Please do not allow the Ocotillo Wind Energy Facility to move forward.

Thank you for your consideration.

Larry M. Powell

LM Powell Development Co.
Larry@Lmpdevco.biz

P.O. Box 27878
Anaheim, CA 92809

714-299-7002 Cell
702-768-6090 Cell
714-970-2140 FAX

"Everyone thinks of changing the world, but no one thinks of changing himself." - Leo Tolstoy
"Two Plus Two Equals Four!" - Newt Gingrich

Perry, Cedric C

From:	Rob Raney <robslizard@gmail.com>
Sent:	Thursday, September 29, 2011 9:00 AM
To:	Perry, Cedric C
Subject:	Ocotillo Wind Energy Facility
Categories:	Ocotillo Exp.

Dear Mr. Cedric Perry,

My wife and I just purchased our home in the area purposed for the wind generating plant. We did so, mostly because we thought the area was so peaceful, untouched and with so much wildlife.

This all seems now to be in jeopardy. We are very much against this proposal.

P80-01

We are, however interested in rooftop generating electricity in our home and would encourage others.

There must be another option.

Respectfully,

Robert Raney
3243 Country Club Rd
Borrego Springs, Ca
PO Box 1026. 92004

Perry, Cedric C

From: K Brooks Reid <breid@csusm.edu>
Sent: Thursday, September 29, 2011 5:38 PM
To: Perry, Cedric C
Subject: Proposed Ocotillo Wind Farm

Categories: Ocotillo Exp.

Dear Mr. Perry,

I want to add my voice to the many who oppose the planned Ocotillo Wind Energy Facility.
The Anza Borrego Foundation has enumerated the many problems with such a facility.

I own a house near the Anza-Borrego State Park, and I value the many positive attributes of such a fine state park that need to be preserved for future generations.
Industrial encroachment must not be allowed to threaten the ecological, cultural, and historical character of the Park.

P81-01

Thank you.

Sincerely,

K. Brooks Reid

K Brooks Reid, Ph. D.
University Founding Faculty
Professor of Mathematics
California State University San Marcos
San Marcos, CA 92096-0001
breid@csusm.edu

Perry, Cedric C

From: kerry rich <kerryrich@sbcglobal.net>
Sent: Sunday, October 02, 2011 12:11 PM
To: Perry, Cedric C

Categories: Ocotillo Exp.

Cedric Perry, I do not want to see the Ocotillo wind project go thru as it will have negative impact on the Anza Borrego Desert, Kerry **P82-01**

Perry, Cedric C

From:	hobbs000@cox.net
Sent:	Thursday, September 29, 2011 2:33 AM
To:	Perry, Cedric C
Subject:	Wind Farm In Borrego Springs
Categories:	Ocotillo Exp.

Please Reject a wind farm in Borrego Springs!!

Please leave it in a pristine and natural state.

P83-01

Thanks for considering this email.

Evan Roman
P.O. Box 8693
La Jolla Ca 92038

Perry, Cedric C

From: Beverly Sabo <2beverfly@gmail.com>
Sent: Friday, September 30, 2011 8:12 AM
To: Perry, Cedric C
Subject: wind farm near anza Borrego

Categories: Ocotillo Exp.

No wind farms on public property.
Let corporations put their businesses on there own land.
Sincerely,
Beverly Sabo

P84-01

Perry, Cedric C

From:	Susan Schaffner <seschaffner@gmail.com>
Sent:	Thursday, September 29, 2011 2:16 PM
To:	Perry, Cedric C
Subject:	Ocotillo Wind Farm Project
Categories:	Ocotillo Exp.

Dear Mr. Perry,

I have been informed of the Ocotillo Wind Farm Project and I'm alarmed at the impact which will result from such a massive facility. Being in close proximity to Anza Borrego State Park, surely we need to rethink this project and its ramifications to the wildlife habitat, the corridors for the Big Horn sheep, the natural landscape and the cultural heritage of the area.

Once this land is developed it is lost forever. Are you willing to sacrifice 12,000 acres of natural land when alternatives are available. There is a massive rush to push ecological friendly energy projects, and that is understandable. But with technology moving and improving so fast, isn't it better to be thoughtful in choosing a plan of action?

I beseech you to wait before leaping into this massive undertaking which will impact the unique, pristine land in question. I love the desert, and I'm not alone. Speaking for all of us who appreciate Anza Borrego, please wait before enacting this project.

P85-01

Thank you for your consideration,

Susan Schaffner

Perry, Cedric C

From: Paulette Schindele <paulette@fastnow.org>
Sent: Saturday, October 01, 2011 2:24 PM
To: Perry, Cedric C
Subject: Please Oppose the Ocotillo Wind Energy Facility

Categories: Ocotillo Exp.

Dear Mr Perry,

I am writing to you regarding the proposed Ocotillo Wind Energy Facility. I strongly oppose the proposed Ocotillo Wind Energy Facility due to its impact on Anza-Borrego Desert State Park (ABDSP). The Anza-Borrego Desert State Park area is not the place for this project. It is much better suited to an already disturbed and/or degraded environment.

Anza-Borrego Desert State Park and the surrounding desert may be viewed by some as a wasteland but it is an open space wonderland to the many animals that rely on it and the people who love it. I am always amazed when I visit there to meet people from all over the world who have come to see our amazing desert. Why is that people from Europe, Asia and other countries appreciate how amazing ABDSP and the animals found here are but all we want to do is find ways to make a profit from it? **P86-01**

Please don't allow 12,000 acres of intact desert habitat to be destroyed for a private for-profit project that will be de-commissioned in just 30 years. This project is not needed. Local rooftop and local distributed renewable energy generation could power the 140,000 homes that this project is slated to power. **P86-02**

Please adopt the no-project alternative and protect our amazing desert. If this project goes through, there will be irreparable damage to the landscape and ecosystem.

- Construction of this project will cause the unavoidable introduction of invasive plant species which are a death sentence to the fragile desert ecology. It will disrupt the wildlife corridors the desert bighorn sheep and other large animals need to have in order to obtain enough food and water to survive. The turbines will kill many, many birds such as the golden eagles, owls, peregrine falcons and any and all others in the vicinity. **P86-03**
- The turbines will also cause the death of bats from direct strikes as well as internal hemorrhaging in the lungs from the drop in air pressure. Bats are very important to the local economy as they eat tons of insects and help protect croplands. **P86-04**
- It will displace and have adverse impacts on a multitude of animals and birds, burrowing owls, long-eared owls, Vaux's swift, flat-tailed horned lizards, barefoot geckos, Red diamond rattlesnakes, American badgers, and several listed plant species. **P86-05**
- Noise and light pollution from the operation of the turbines. **P86-06**

America is turning into one industrialized wasteland after another in the name of "progress". Don't let this happen here. ABDSP is one of the few truly wild places left in California. Please help keep its special wildness, quite, and dark skies safe for future generations. **P86-07**

Sincerely,

Paulette Schindele

Paulette@fastnow.org

Comment Letter P87

From: Daren R. Sefcik
To: Angelina Havens
Subject: Comment on Ocotillo Wind Energy Facility
Date: Tuesday, July 19, 2011 8:12:18 PM

Hello,

I am writing to comment on the Ocotillo Wind Energy Facility and express my opposition to it. The installation of 100+ wind turbines across the desert floor will absolutely destroy the scenic landscapes and cause unknown damage to the habitat and wildlife that call those areas of the desert home. **P87-01**

I am also concerned the project will not produce it's required energy output and require load followers from alternative sources that may not be from clean, renewable sources. **P87-02**

Thank you,
Daren Sefcik

Perry, Cedric C

From:	Britta Lee Shain <howlingcoyote@teepeemusic.com>
Sent:	Thursday, September 29, 2011 9:46 AM
To:	Perry, Cedric C
Subject:	Proposed Wind Farm in Anza Borrego State Park
Categories:	Ocotillo Exp.

Dear Mr. Perry...

I am writing to encourage you to put a halt to the planned proposed Wind Farm in Ocotillo near my home in the Anza Borrego State Park. I have been living in the park for the last 8 years since losing my home in the devastating Cedar Fire, and the pure peace and quiet along with the vast wildlife have been a healing influence on me and my family as well as on the lives of countless desert visitors for the last many years and hopefully will be for many years into the future. **P88-01**

The Anza-Borrego desert is a bird migration zone and wind-turbines are known to kill birds. I have recorded more than 90 species just in my yard a few miles down the road from this proposed wind farm and I have the photographs to prove it. I have seen Indian artifacts and other historical remnants in the vicinity of this proposed wind farm as well as Big Horned sheep. **P88-02**

My neighbor put in a personal wind turbine and it has totally destroyed the ambience and natural feel of the area. Not only is the sound of machinery appalling, but the flickering light that is produced frightens the birds and wildlife and makes it impossible for my husband and i to use our yard at times. That is 1 turbine. 155 turbines will do irrevocable damage to one of nature's perfect creations. **P88-03**

This is a desert. Solar is the way to go. It's quiet, it's clean and it doesn't harm the environment. **P88-04**

Please stop this wind farm from destroying anymore of California's natural beauty.

Thank you for your consideration.

Britta Lee Shain

P.S. The cover photo of my CD was taken in the Anza-Borrego Desert.

BRITTA LEE SHAIN

BRITTA LEE SHAIN
BETWEEN THE RIVER AND THE ROAD

HEAR MY NEW CD @
BrittaLeeShain.com

If I have learned any lesson from this bumpy journey, it's that there is no reason to treat anyone with anything less than kindness.... ever. ~ Eric Lowen

Comment Letter P89

Perry, Cedric C

From:	peter shapiro <borregomax@yahoo.com>
Sent:	Thursday, September 29, 2011 6:47 PM
To:	Perry, Cedric C
Cc:	info@theabf.org
Subject:	Ocotillo Wind Energy Facility
Categories:	Ocotillo Exp.

September 29, 2011
Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
Re: Ocotillo Wind Energy Facility
Dear Mr. Perry,

My name is Peter Shapiro and as a homeowner in Borrego Springs, a hiker and lover of the natural beauty of the Anza-Borrego Desert Region I am appalled there is a proposal to install wind farm behemoths in the Ocotillo area! The fact this is even under consideration is astounding given the fight over the years against the Sunrise Powerlink.

I have owned a home in Montesoro for over 12 years and have been visiting the Anza-Borrego area for over 25 years. It is a pristine area, a joy to behold and must not be spoiled by towers reaching hundreds of feet into the air to be seen for miles and miles. Yes, I understand and appreciate the fact that we need to address our insatiable need for energy but to put these windmills in an area so adjacent to an incredible and unique desert State park is morally and ethically wrong; it shows a tremendous lack of respect and care for our local environment, the people of Ocotillo, and the thousands of visitors to the Park and BLM land as well.

P89-01

It is my understanding that the draft EIS does not meet NEPA requirements because it lacks a full range of alternatives, namely, the alternative of producing renewable energy on rooftops in the cities where the energy is used. I highly encourage The Bureau of Land Management to adopt a "no-project" alternative. The BLM is mandated to consider viable alternatives that could meet the "need" for the project that lie outside of lands within their jurisdiction.

P89-02

I also understand that local rooftop and local distributed renewable energy generation could power the 140,000 homes that this project is slated to power. I urge the BLM to adopt the no-project alternative and protect 12,000 acres of intact desert habitat from destruction for private profit on a project that will be de-commissioned in 30 years! If this project goes through, there will be irreparable damage to the landscape. Please do not let this project proceed!

P89-03

Sincerely,

Cc: FAX copy to the State Clearinghouse: 916-323-3018
Anza- Borrego Foundation via email

Peter Shapiro | Managing Director | sageleadership coaching
P O Box 5000 PMB 144 | Rancho Santa Fe, CA 92067
peter.shapiro1@gmail.com/borregomax@yahoo.com | 818-425-0813

Comment Letter P90

Perry, Cedric C

From: Rachel D. Shaw <shawrd@macdialup.com>
Sent: Monday, October 03, 2011 10:04 AM
To: Perry, Cedric C
Cc: angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Subject: Ocotillo Express Wind Project

Categories: Ocotillo Exp.

Dear Mr. Perry,

I am writing in opposition to the proposed Ocotillo Express Wind Project. My family has been visiting Anza Borrego for years now, as part of our annual holiday reunion, and I have many fond memories of exploring the area's wild areas and enjoying the wildlife and scenery, and the peacefulness of the place. Adding a wind farm will ruin this experience for us, not to mention damaging or destroying the environment and its animals, such as the bighorn sheep, eagles, and bats--all of which are already under stress elsewhere. **P90-01**

I'm also disturbed that I only just learned about this project, and that there's so little time in which to comment on it. So I'm requesting that the comment period be extended, so that I can tell my friends and family about this; I know they have opinions on it, and they have a right to speak. **P90-02**

I myself do not like this project, and think it should not be allowed to proceed. **P90-03**

Thank you.

~~Rachel Shaw

Rachel D. Shaw

shawrd@macdialup.com

http://independent.academia.edu/RachelShaw
http://sungazer.zenfolio.com

Comment Letter P91

Perry, Cedric C

From: Ralph Singer <NIGHTMID@earthlink.net>
Sent: Monday, September 26, 2011 4:36 PM
To: Perry, Cedric C
Cc: Diana Lindsay; Terry Weiner; Gail Sevrens; Mark Jorgensen; Ester Rubin
Subject: Ocotillo Express

Categories: Ocotillo Exp.

Dear Cedric Perry, Project Manager, Ocotillo Express Desert Wind Project

The Bureau of Land Management recently denied the pubic comment opportunities at the El Centro and Ocotillo meetings for the proposed 12,000-acre Ocotillo Wind Express Energy Project on August 24th and 25th, 2011.

Public comments are an important process in the review of large projects like this. Many people would prefer to submit their comments at a meeting rather than in writing. The BLM need only provide a court reporter to record oral comments. When people travel great distances and are not permitted to speak, it appears as though the BLM has already decided to approve this project. This wind project will have negative impacts on native plants and wildlife, prehistoric cultural sites, Native American values, visual resources, private property, property values, and access to public lands. It is the responsibility of the BLM to hear all concerns associated with this project. The BLM can best accomplish this by accepting all comments in both written and oral form. **P91-01**

The BLM's National Environmental Policy Act Handbook States: "Public involvement begins early in the NEPA process, with scoping, and continues throughout the preparation of the analysis and the decision." Agencies are required to "make diligent efforts to involve the public in preparing and implementing their NEPA procedures" (40 CFR 1506.6(a). **P91-02**

I would like to request that the BLM hold another series of public meetings in the local communities in which oral public comments are accepted and recorded. I would also like to request a 30 day extension on the comment deadline for the Draft Environmental Impact Statement. This would allow more time for the public to prepare for additional meetings. Anza Borrego Foundation represents 1800 + members, and works with Anza Borrego Desert State Park as a Cooperating Association. **P91-03**

We are quite anxious to ensure that the public has an adequate opportunity to express their approval or disapproval regarding this project

Sincerely,

Ralph Singer

Vice President
Environmental Affairs
Anza Borrego Foundation

Ralph Singer
nightmid@earthlink.net

Comment Letter P92

Perry, Cedric C

From: Joann Stang <jcstang@cox.net>
Sent: Wednesday, September 28, 2011 7:21 AM
To: Perry, Cedric C
Subject: Ocotilla Express Wind Turbine Project

Categories: Ocotillo Exp.

To: Cedric Perry
California Desert District Office
Bureau of Land Management

Re: Proposed Ocotillo Express Wind Turbine Project

As a former resident of Borrego Springs, CA, a long time supporter of the Anza Borrego Desert State Park, and a continuing vacationer in the Park, I express my ***strong opposition*** to the proposed Ocotillo Wind Energy Facility. I love the Anza Borrego Desert and know from years of experience walking and living there how difficult it is to keep the land and its fauna and flora in native condition. When I first visited I thought there was nothing to see in the desert, but I now know how wrong that first impression was. Walking there is a lesson in geology, archeology and paleontology and it is great exercise and lots of fun also. Installing a wind farm adjacent to the Park would have major impact on the desert bighorn sheep corridors, and adverse impact on birds such as owls and falcons, and animals such as snakes and lizards. It will be a visual eyesore in an area that is frequently visited and there will be irreparable damage to the landscape. **P92-01**

While I am a strong supporter of alternative and green energy, I just don't see why it is necessary to "plant" this very large project next to this Park. Annually I travel between San Diego and the mid-west by small airplane and know from my personal experience that there are many large areas in this country that are not close to people or other state/national parks. Perhaps there is a good location for this project, but it is not next to Anza Borrego Park. **P92-02**

Please protect 12,000 acres of intact desert habitat from destruction and at the same time protect the beauty that is the Anza Borrego Desert State Park. **P92-03**

Joann Stang
jcstang@cox.net

Comment Letter P93

Perry, Cedric C

From: sandy steinman <sandysteinman@gmail.com>
Sent: Thursday, September 29, 2011 8:10 AM
To: Perry, Cedric C
Subject: Oppose proposed Ocotillo Wind Energy Facility

Categories: Ocotillo Exp.

Please oppose proposed Ocotillo Wind Energy Facility.

Impacts to Natural Resources of Anza-Borrego Desert State Park (ABDSP):

1. Disruption of wildlife corridors for desert bighorn sheep.
2. Adverse effects to golden eagles due to the birds striking the turbines.
3. Adverse impacts to burrowing owls, long-eared owls, Vaux's swift, peregrine falcons, flat-tailed horned lizards, barefoot gecko several listed plant species.
4. Could cause significant deaths of bats due to the drop in air pressure causing internal hemorrhaging in the lungs as well as de
5. Unavoidable impact to plants during construction and the introduction of invasive plant species.
6. Permanent scarring to the landscape leaving an "industrial" look to the area.

P93-01

Impacts to Cultural Resources of ABDSP:

1. Visual impacts to the newly designated Cultural Preserve at Piedras Grandes, just west of Ocotillo and its "sacred site."
2. No adequate accounting for impacts to the multiple cultural resources of the area when viewed as a cultural landscape.
3. Cultural Studies not completed prior to assessing impacts.

P93-02

Other Potential Impacts

1. Substantial increase in noise levels from the operation of the turbines, especially at night in surrounding areas.
2. Impacts to air quality from truck traffic and from concrete batch plants.
3. Increased risk of wildfire hazards.
4. Loss of soil's ability to absorb carbon from scraping.
5. Degradation to the recreational and natural experience of ABDSP by the sight of the turbines and associated facilities.
6. Loss of dark night skies.
7. Degradation of wilderness character of the several BLM wildernesses surrounding the proposed project.

P93-03

The NEPA (Environmental Protection Agency) Document does not include an alternative for production of renewable e EIR/EIS is incomplete.

Please adopt the "no project" alternative and protect this important desert habitat from devastation

P93-04

Letters are extremely important RIGHT NOW. Please personalize your letter, adding your own experiences would mean to you personally.

The draft EIS (Environmental Impact Study) does not meet NEPA requirements because it *lacks a full rang* producing renewable energy on rooftops in the cities where the energy is used. The BLM (Bureau of Land alternative. The BLM is mandated to consider viable alternatives that could meet the "need" for the project

P93-05

This project is not needed.

Please let me know as soon as possible if my request will be honored, as I will need to rearrange my life to get comments submitted by the current Sept 16th deadline.

If you are not the decision maker on this request, please forward this message to that person.

P94-06, cont.

Thank you,

Donna Tisdale, President
Backcountry Against Dumps
PO Box 1275
Boulevard, CA 91905
619-766-4170

From: Donna Tisdale [tisdale.donna@gmail.com]
Sent: Monday, September 19, 2011 5:06 PM
To: cperry@blm.gov; jchilders@ca.blm.gov; Angelina Havens
Cc: Sam and Sherry Milham; svolker; jvolker
Subject: Ocotillo Wind-SMilham MD, MPH-DEIR/EIS comments
Attachments: scan0001.jpg; Diseases of civilzation and Dirty Electricity.pdf; La Quinta Middle school teachers' cancers.pdf; I 10 west wind substation 2009,2011 ground current.pdf

To: BLM Project Manager: Cedric Perry c/o Jeff Childers & Imperial County Planning & Development Services: Angelina Havens
From: Donna Tisdale: PO Box 1275, Boulevard, CA 91905 (619) 766-4170

Please include the message below and 4 attachments (addressed to me) from Samuel Milham MD,MPH, (in response to my request) as timely public comments on the Ocotillo Wind DEIR/EIS. Dr. Milham approved my request to submit and share his comments and is cc'd on this message. **P95-01**

Starting at page 3.12-6, the OWEF DEIR/EIS coldly and erroneously dismisses more recent evidence documenting DIRTY ELECTRICITY/HIGH FREQUENCY VOLTAGE TRANSIENTS AND HARMONICS, that represent significant health hazards as a "potent universal carcinogen", as so well documented by Dr.Milham in his book. More related documentation will be submitted with formal comments. Attempts to suppress the evidence of this very real threat to public health and safety are unconscionable, unethical, and immoral and will not be tolerated. **P95-02**

Thank you

---------- Forwardedmessage----------
From: **Sam and Sherry Milham** <smilham2@comcast.net>
Date: Thu, Sep 8, 2011 at 8:12 AM
Subject: RE: request for comment letter
To: Donna Tisdale <tisdale.donna@gmail.com>

To whom it may concern:
Dirty electricity is a term coined by the utilities to describe high frequency voltage transients and harmonics riding along on the 60 Hz electricity provided in this country. It is generated by anything that interrupts current flow such as switching power supplies and inverters. It is a potent universal carcinogen. Wind farm electricity is generated at non-grid frequency , and uses inverters to change the generated electricity to grid frequency. These devices interrupt current flow and generate dirty electricity which travels in the earth and wires in the substation service area. I'm attaching an oscilloscope tracing of the ground current taken at a substation at the I 10 wind farm. Also, The infrasound created by the windmill vanes make some people sick. I have written a book called "Dirty Electricity" describing the health effects of dirty electricity. I have measured the dirty electricity in the earth and air near wind farm substations and in buildings supplied with their electricity. It is always at levels which are a health hazard to nearby residents. Samuel Milham MD, MPH

From: Donna Tisdale [mailto:tisdale.donna@gmail.com]
Sent: Wednesday, September 07, 2011 7:38 PM

To: Sam and Sherry Milham

Subject: Re: request for comment letter

file:///S|/...Letters/Ocotillo Wind SMilham MD, MPH-DEIR EIS comments/Ocotillo Wind SMilham MD MPH-DEIR EIS comments.htm[09/22/2011 10:16:20 AM]

AMERICAN JOURNAL OF INDUSTRIAL MEDICINE (2008)

A New Electromagnetic Exposure Metric: High Frequency Voltage Transients Associated With Increased Cancer Incidence in Teachers in a California School

Samuel Milham, MD, MPH[1,3] and L. Lloyd Morgan, BS[2]

Background *In 2003 the teachers at La Quinta, California middle school complained that they had more cancers than would be expected. A consultant for the school district denied that there was a problem.*

Objectives *To investigate the cancer incidence in the teachers, and its cause.*

Method *We conducted a retrospective study of cancer incidence in the teachers' cohort in relationship to the school's electrical environment.*

Results *Sixteen school teachers in a cohort of 137 teachers hired in 1988 through 2005 were diagnosed with 18 cancers. The observed to expected (O/E) risk ratio for all cancers was 2.78 ($P = 0.000098$), while the O/E risk ratio for malignant melanoma was 9.8 ($P = 0.0008$). Thyroid cancer had a risk ratio of 13.3 ($P = 0.0098$), and uterine cancer had a risk ratio of 9.2 ($P = 0.019$). Sixty Hertz magnetic fields showed no association with cancer incidence. A new exposure metric, high frequency voltage transients, did show a positive correlation to cancer incidence. A cohort cancer incidence analysis of the teacher population showed a positive trend ($P = 7.1 \times 10^{-10}$) of increasing cancer risk with increasing cumulative exposure to high frequency voltage transients on the classroom's electrical wiring measured with a Graham/Stetzer (G/S) meter. The attributable risk of cancer associated with this exposure was 64%. A single year of employment at this school increased a teacher's cancer risk by 21%.*

Conclusion *The cancer incidence in the teachers at this school is unusually high and is strongly associated with high frequency voltage transients, which may be a universal carcinogen, similar to ionizing radiation.* Am. J. Ind. Med. 2008. © 2008 Wiley-Liss, Inc.

KEY WORDS: high frequency voltage transients; electricity; dirty power; cancer; school teachers; carcinogen

BACKGROUND

Since the 1979 Wertheimer–Leeper study [Wertheimer and Leeper, 1979] there has been concern that exposure to power frequency (50/60 Hz) EMFs, especially magnetic fields, may contribute to adverse health effects including cancer. Until now, the most commonly used exposure metric has been the time weighted average of the power frequency magnetic field. However, the low risk ratios in most studies suggest that magnetic fields might be a surrogate for a more important metric. In this paper we present evidence that a

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new exposure metric, high frequency voltage transients existing on electrical power wiring, is an important predictor of cancer incidence in an exposed population.

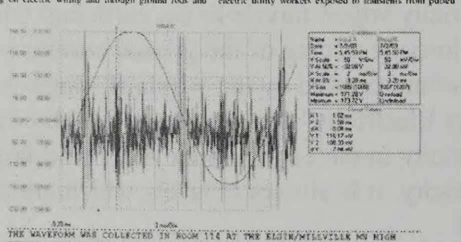
The new metric, GS units, used in this investigation is measured with a Graham/Stetzer meter (G/S meter) also known as a Microsurge II meter (MS II meter), which is plugged into electric outlets [Graham, 2005]. This meter displays the average rate of change of these high frequency voltage transients that exist everywhere on electric power wiring. High frequency voltage transients found on electrical wiring both inside and outside of buildings are caused by an interruption of electrical current flow. The electrical utility industry has referred to these transients as "dirty power."

There are many sources of "dirty power" in today's electrical equipment. Examples of electrical equipment designed to operate with interrupted current flow are light dimmer switches that interrupt the current twice per cycle (120 times/s), power saving compact fluorescent lights that interrupt the current at least 20,000 times/s, halogen lamps, electronic transformers and most electronic equipment manufactured since the mid-1980s that use switching power supplies. Dirty power generated by electrical equipment in a building is distributed throughout the building on the electric wiring. Dirty power generated outside the building enters the building on electric wiring and through ground rods and conductive plumbing, while within buildings, it is usually the result of interrupted current generated by electrical appliances and equipment.

Each interruption of current flow results in a voltage spike described by the equation V = L × di/dt, where V is the voltage, L is the inductance of the electrical wiring circuit and di/dt is the rate of change of the interrupted current. The voltage spike decays in an oscillatory manner. The oscillation frequency is the resonant frequency of the electrical circuit. The G/S meter measures the average magnitude of the rate of change of voltage as a function of time (dV/dT). This preferentially measures the higher frequency transients. The measurements of dV/dT read by the meter are defined as GS (Graham/Stetzer) units.

The bandwidth of the G/S meter is in the frequency range of these decaying oscillations. Figure 1 shows a two-channel oscilloscope display. One channel displays the 60 Hz voltage on an electrical outlet while the other channel with a 10 kHz hi-pass filter between the oscilloscope and the electrical outlet, displays the high frequency voltage transients on the same electrical outlet [Havas and Stetzer, 2004, reproduced with permission].

Although no other published studies have measured high frequency voltage transients and risk of cancer, one study of electric utility workers exposed to transients from pulsed



THE WAVEFORM WAS COLLECTED IN ROOM 114 AT THE ELGIN/MILLVILLE MN HIGH SCHOOL. CHANNEL 1 WAS CONNECTED TO THE 120 VAC UTILITY SUPPLIED POWER RECEPTACLE. CHANNEL 2 WAS CONNECTED TO THE SAME POTENTIAL, EXCEPT THROUGH THE GRAHAM UBIQUITOUS FILTER. (REMOVES THE 60 HERTZ) THE AREA BETWEEN THE CURSORS REPRESENTS A FREQUENCY OF 25 KILO HERTZ. A TEACHER WHO PREVIOUSLY OCCUPIED THE ROOM DIED OF BRAIN TUMORS AND THE TEACHER IN THE ADJOINING ROOM DIED OF LUEKEMIA.

FIGURE 1. Oscilloscope display of dirty power. 60 Hz electrical power in channel 1 with concurrent high frequency voltage transients channel 2. A 10 kHz hi-pass filter was used to remove the 60 Hz voltage and its harmonics. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

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Attention Deficit Hyperactivity Disorder and Dirty Electricity

To the Editor:

In February 2010, while studying a cancer cluster in teachers at a California elementary school, a fourth-grade teacher complained that her students were hyperactive and unteachable. The classroom levels of high-frequency voltage transients (dirty electricity) in the radio frequencies (RF) between 4 and 100 kHz measured in the outlets of her classroom with a Graham/Stetzer Microsurge meter were very high. Dirty electricity is a term coined by the electrical utilities to describe electrical pollution contaminating the 60 Hz electricity on the electrical grid. A cell phone tower on campus a few feet from this classroom and unshielded fluorescent lights both contributed to the electrical pollution in this room. Cell tower transmitters, like most modern electrical equipment, operate on direct current. The electrical current brought to the tower is alternating current that needs to be changed to direct current. This is done by a switching power supply. These devices interrupt the alternating current and are the likely major source of the dirty electricity in the classroom.

On a Friday afternoon after school, I filtered the 5 outlets in this room with Graham/Stetzer plug-in capacitive filters, reducing the measured dirty electricity in the room wiring from more than 5000 Graham/Stetzer units to less than 50 units. With no change in either the lighting or the cell tower radiation, the teacher reported an immediate dramatic improvement in the behavior of her students in the following week. They were calmer, paid more attention, and were teachable all week except for Wednesday when they spent part of the day in the library.

In his 1973 book, Health and Light,[1] John N. Ott described a 1973 study of 4 first-grade classrooms in a windowless Sarasota, Florida school. Two of the rooms had standard white fluorescent lighting and the other two had full-spectrum fluorescent lighting with a grounded aluminum wire screen to remove the RF radiation produced by fluorescent bulbs and ballasts. Concealed time-lapse cameras recorded student behavior in classrooms for 4 months.[2] In the unshielded rooms, the first graders developed, "... nervous fatigue, irritability, lapses of attention, and hyperactive behavior." "... students could be observed fidgeting to an extreme degree, leaping from their seats, flailing their arms, and paying little attention to their teachers." In the RF-shielded rooms, "Behavior was entirely different. Youngsters were calmer and far more interested in their work."

The Old Order Amish live without electricity. A pediatric group practice in Jasper, Indiana, which cares for more than 800 Amish families has not diagnosed a single child with attention deficit hyperactivity disorder (ADHD).[3] Dozens of cases of childhood ADHD have been "cured" with no further need for drugs by simply changing their electrical environments (Stetzer D, personal communication [www.Stetzerelectric.com]).

Before children are treated with drugs for ADHD, the dirty electricity levels in their homes and school environments should first be examined and reduced if needed.

I present the epidemiologic evidence linking dirty electricity to the other diseases of civilization in a recent book.[4,5]

Disclosure: The authors declare no conflict of interest.

Samuel Milham, MD, MPH
Washington State Health Department
Tumwater, WA

REFERENCES

1. Ott JN. Afterword. In: *Health and Light*. Columbus, OH: Atlanta, GA: Ariel Press; 1973:200–208.
2. Ott JN. *Exploring the Spectrum: The Effects of Natural and Artificial Light on Living Organisms* [DVD]; 2008.
3. Ruff ME. Attention deficit disorder and stimulant use: an epidemic of modernity. *Clin Pediatr (Phila)*. 2005;44:557–563.
4. Milham S. *Dirty Electricity*. Bloomington, IN: iUniverse; 2010.
5. www.sammilham.com.

IN PRESS: JOURNAL OF DEVELOPMENTAL AND
BEHAVIORAL PEDIATRICS

Comment Letter P95

electromagnetic fields found an increased incidence of lung cancer among exposed workers [Armstrong et al., 1994].

INTRODUCTION

In February 2004, a Palm Springs, California newspaper, The Desert Sun, printed an article titled, "Specialist discounts cancer cluster at school," in which a local tumor registry epidemiologist claimed that there was no cancer cluster or increased cancer incidence at the school [Perrault, 2004]. An Internet search revealed that the teacher population at La Quinta Middle School (LQMS) was too small to generate the 11 teachers with cancer who were reported in the article. The school was opened in 1988 with 20 teachers hired that year. For the first 2 years, the school operated in three temporary buildings, one of which remains. In 1990, a newly constructed school opened. In 2003, the teachers complained to school district management that they believed that they had too many cancers. Repeated requests to the school administration for physical access to the school and for teachers' information were denied. We contacted the teachers, and with their help, the cancers in the group were characterized. One teacher suggested using yearbooks to develop population-at-risk counts for calculating expected cancers. We were anxious to assess the electrical environment at the school, since elevated power frequency magnetic field exposure with a positive correlation between duration of exposure and cancer incidence had been reported in first floor office workers who worked in strong magnetic fields above three basement-mounted 12,000 V transformers [Milham, 1996]. We also wanted to use a new electrical measurement tool, the Graham/Stetzer meter, which measures high frequency voltage transients.

The Graham/Stetzer Microsurge II meter measures the average rate of change of the transients in Graham/Stetzer units (GS units). Anecdotal reports had linked dirty power exposure with a number of illnesses [Havas and Stetzer, 2004]. We decided to investigate whether power frequency magnetic field exposure or dirty power exposure could explain the cancer increase in the school teachers.

METHODS

After the school administration (Desert Sands Unified School District) had refused a number of requests to assist in helping us evaluate the cancers reported by the teachers, we were invited by a teacher to visit the school after hours to make magnetic field and dirty power measurements. During that visit, we noted that, with the exception of one classroom near the electrical service room, the classroom magnetic field levels were uniformly low, but the dirty power levels were very high, giving many overload readings. When we reported this to Dr. Doris Wilson, then the superintendent of schools (retired December, 2007), one of us (SM) was threatened with prosecution for "unlawful trespass," and the teacher who had invited us into the school received a letter of reprimand. The teachers then filed a California OSHA complaint which ultimately lead to a thorough measurement of magnetic fields and dirty power levels at the school by the California Department of Health Services which provided the exposure data for this study. They also provided comparison dirty power data from residences and an office building, and expedited tumor registry confirmation of cancer cases.

Classrooms were measured at different times using 3 meters: an FW Bell model 4080 tri-axial Gaussmeter, a Dexsil 310 Gaussmeter, and a Graham-Stetzer (G/S) meter. The Bell meter measures magnetic fields between 25 and 1,000 Hz. The Dexsil meter measures magnetic fields between 30 and 300 Hz. The G/S meter measures the average rate of change of the high frequency voltage transients between 4 and 150 KHz.

All measurements of high frequency voltage transients were made with the G/S meter. This meter was plugged into outlets, and a liquid crystal display was read. All measurements reported were in GS units. The average value was reported where more than one measurement was made in a classroom.

We measured seven classrooms in February 2005 using the Bell meter and the G/S meter. Later in 2005, the teachers measured 37 rooms using the same meters. On June 8, 2006, electrical consultants for the school district and the California Department of Health Services (Dr. Raymond Neutra) repeated the survey using the G/S meter and a Dexsil 320 Gaussmeter, measuring 51 rooms. We used results of this June 8, 2006 sampling in our exposure calculations, since all classrooms were sampled, multiple outlets per room were sampled, and an experienced team did the sampling. Additionally, GS readings were taken at Griffin Elementary school near Olympia, Washington, and Dr. Raymond Neutra provided GS readings for his Richmond California office building and 125 private California residences measured in another Northern California study.

All the cancer case information was developed by personal, telephone, and E-mail contact with the teachers or their families without any assistance from the school district. The local tumor registry verified all the cancer cases with the exception of one case diagnosed out of state and the two cases reported in 2007. The out-of state case was verified by pathologic information provided by the treating hospital. The teachers gathered population-at-risk information (age at hire, year of hire, vital status, date of diagnosis, date of death, and termination year) from yearbooks and from personal contact. The teachers also provided a history of classroom assignments for all teachers from annual classroom assignment rosters (academic years 1990–1991 to 2006–2007) generated by the school administration. The school administration provided a listing of school employees, including the teachers, to the regional tumor registry after the teachers involved the state health agency by submitting an OSHA complaint. The information we obtained anecdotally from the teachers, yearbooks, and classroom assignment rosters was nearly identical to that given to the tumor registry. None of the cancer cases were ascertained initially through the cancer registry search.

Published cancer incidence rates by age, sex, and race for all cancers, as well as for malignant melanoma, thyroid, uterine, breast, colon, ovarian cancers, and non-Hodgkin's lymphoma (NHL) were obtained from a California Cancer Registry publication [Kwong et al., 2001]. We estimated the expected cancer rate for each teacher by applying year, age, sex, and race-specific cancer incidence rates from hire date until June 2007, or until death. We then summed each teacher's expected cancer rate for the total cohort.

Using the California cancer incidence data, the school teacher data, and the GS exposure data, we calculated cancer incidence and risks. A replicate data set was sent to Dr. Gary Marsh and to Mike Cunningham at the University of Pittsburgh School of Public Health for independent analysis using OCMAP software. We calculated cancer risk ratios by duration of employment and by cumulative GS unit-years of exposure. We calculated an attributable risk percent using the frequencies of total observed and expected cancers, and performed trend tests [Breslow and Day, 1987] for cancer risk versus duration of employment and cumulative GS unit-years of exposure. Poisson *P* values were calculated using the Stat Trek website (Stat Trek, 2007). We also performed a linear regression of cancer risk by duration of employment in years and by time-weighted exposure in GS unit-years.

Since neither author had a current institutional affiliation, institutional review board approval was not possible. The teachers requested the study, and their participation in the study was both voluntary and complete. All the active teachers at the school signed the Cal OSHA request. The authors fully explained the nature of the study to study participants and offered no remuneration to the teachers for participation in the study. The authors maintained strict confidentiality of all medical and personal information provided to us by the teachers, and removed personal identifiers from the data set which was analyzed by the University of Pittsburgh. Possession of personal medical information was limited to the two authors. No patient-specific information was obtained from the tumor registry. With the individual's permission we provided the registry with case information for a teacher with malignant melanoma diagnosed out of state. The exposure information was provided by the California Department of Health Services. The basic findings of the study were presented to the Desert Sands Unified School District School Board and at a public meeting arranged by the teachers.

RESULTS

Electrical Measurements

In our seven-room survey of the school in 2005, magnetic field readings were as high as 177 mG in a classroom adjacent to the electrical service room. A number of outlets had overload readings with the G/S meter. Magnetic fields were not elevated (>3.0 mG) in the interior space of any of the classrooms except in the classroom adjacent to the electrical service room, and near classroom electrical appliances such as overhead transparency projectors. There was no association between the risk of cancer and 60 Hz magnetic field exposures in this cohort, since the classroom magnetic field exposures were the same for teachers with and without cancer (results not shown).

This school had very high GS readings and an association between high frequency voltage transient exposure in the teachers and risk of cancer. The G/S meter gives readings in the range from 0 to 1,999 GS units. The case school had 13 of 51 measured rooms with at least one electrical outlet measuring "overload" (≥2,000 GS units). These readings were high compared to another school near Olympia Washington, a Richmond California office building, and private residences in Northern California (Table I). Altogether, 631 rooms were surveyed for this study. Only 17 (2.69%) of the 631 rooms had an "overload" (maximum, ≥2,000 GS units) reading. Applying this percentage to the 51 rooms surveyed at the case school, we would expect 1.4 rooms at the school to have overload GS readings (0.0269 × 51 = 1.37). However, thirteen rooms (25%) measured at the case school had "overload" measurements above the highest value (1,999 GS units) that the G/S meter can measure. This is a highly statistically significant excess over expectation (Poisson $P = 3.14 \times 10^{-9}$).

TABLE I. Graham/Stetzer Meter Readings: Median Values in Schools, Homes and an Office Building

Place	Homes	Office bldg	Olympia WA School	LQMS	Total
No. of rooms surveyed	500	39	41	51	631
Median GS units	159	210	160	750	< 270^{a}
Rooms with overload GS units (>2,000)	4	0	0	13^{b}	17

^{a}Excludes homes as specific room data was not available.
$^{b}P = 3.14 \times 10^{-9}$.

TABLE II. Risk of Cancer by Type Among Teachers at La Quinta Middle School

Cancer	Observed	Expected	Risk ratio (O/E)	P-value
All cancers	18	6.51	2.78*	0.000098
Malignant melanoma	4	0.41	9.76*	0.0008
Thyroid cancer	2	0.15	13.3*	0.011
Uterus cancer	2	0.22	9.19*	0.019
Female breast cancer	2	1.5	1.34	0.24
All cancers less melanoma	14	6.10	2.30*	0.0025

*$P \leq 0.05$

We noticed AM radio interference in the vicinity of the school. A teacher also reported similar radio interference in his classroom and in the field near his ground floor classroom. In May 2007, he reported that 11 of 15 outlets in his classroom overloaded the G/S meter. An AM radio tuned off station is a sensitive detector of dirty power, giving a loud buzzing noise in the presence of dirty power sources even though the AM band is beyond the bandwidth of the G/S meter.

Cancer Incidence

Three more teachers were diagnosed with cancer in 2005 after the first 11 cancer diagnoses were reported, and another former teacher (diagnosed out-of-state in 2000) was reported by a family member employed in the school system. One cancer was diagnosed in 2006 and two more in 2007. In the years 1988–2005, 137 teachers were employed at the school. The 18 cancers in the 16 teachers were: 4 malignant melanomas, 2 female breast cancers, 2 cancers of the thyroid, 2 uterine cancers and one each of Burkitt's lymphoma (a type of non-Hodgkins lymphoma), polycythemia vera, multiple myeloma, leiomyosarcoma and cancer of the colon, pancreas, ovary and larynx. Two teachers had two primary cancers each: malignant melanoma and multiple myeloma, and colon and pancreatic cancer. Four teachers had died of cancer through August 2007. There have been no non-cancer deaths to date.

The teachers' cohort accumulated 1,576 teacher-years of risk between September 1988 and June 2007 based on a 12-month academic year. Average age at hire was 36 years. In 2007, the average age of the cohort was 47.5 years.

When we applied total cancer and specific cancer incidence rates by year, age, sex, race, and adjusted for cohort ageing, we found an estimate of 6.5 expected cancers, 0.41 melanomas, 0.15 thyroid cancers, 0.22 uterine cancers, and 1.5 female breast cancers (Table II). For all cancers, the risk ratio (Observed/Expected = 18/6.5) was 2.78 ($P = 0.000098$, Poisson test); for melanoma, (O/E = 4/0.41) was 9.8 ($P = 0.0008$, Poisson test); for thyroid cancer (O/E = 2/0.15) was 13.3 ($P = 0.0011$, Poisson test); for uterine cancer (O/E = 2/0.22), was 9.19 ($P = 0.019$, Poisson test).

Table III shows the cancer risk among the teachers by duration of employment. Half the teachers worked at the school for less than 3 years (average 1.52 years). The cancer risk increases with duration of employment, as is expected when there is exposure to an occupational carcinogen. The cancer risk ratio rose from 1.7 for less than 3 years, to 2.9 for 3–14 years, to 4.2 for 15+ years of employment. There was a positive trend of increasing cancer incidence with increasing duration of employment ($P = 4.6 \times 10^{-10}$). A single year of employment at this school increases a teacher's risk of cancer by 21%.

Using the June 8, 2006 survey data (Table IV), the cancer risk of a teacher having ever worked in a room with at least one outlet with an overload GS reading (≥2000 GS units) and employed for 10 years or more, was 7.1 ($P = 0.00007$, Poisson test). In this group, there were six teachers diagnosed with a total of seven cancers, and four teachers without a cancer diagnosis, who were employed for 10 or more years and who ever worked in one of these rooms. Five teachers had one primary cancer and one teacher had two primary cancers. These teachers made up 7.3% of the teachers' population (10/137) but had 7 cancers or 39% (7/18) of the total cancers. The 10 teachers who worked in an overload classroom for 10 years or more had 7 cancers when 0.99 would have been expected ($P = 6.8 \times 10^{-5}$ Poisson test). The risk ratio for the 8 teachers with cancer and 32 teachers without cancer, who ever worked in a room with an overload GS reading, regardless of the time at the school, was 5.1 ($P = 0.00003$, Poisson test). The risk ratio for 8 teachers with cancer and 89 teachers without cancer who never worked in a room with an overload G-S reading was 1.8 ($P = 0.047$, Poisson test). Teachers who never worked in an overload classroom also had a statistically significantly increased risk of cancer.

TABLE III. Cancer Risk by Duration of Employment

Time at school	Average time	Teachers	% of teachers	Cancer observed	Cancer expected	Risk ratio (O/E)	Poisson p
< 3 years	1.52 years	68	49.6	4	2.34	1.72	0.12
3–14 years	7.46 years	56	40.9	9	3.14	2.87*	0.0037
15+ years	16.77 years	12	8.8	5	1.02	4.89*	0.0034
Total		137	100	18	6.51	2.78*	0.000098

Positive trend test (Chi square with one degree of freedom = 38.9, $P = 4.61 \times 10^{-10}$).
*$P \leq 0.05$

TABLE IV. Cancer in Teachers Who Ever Taught in Classrooms With at Least One Overload GS Reading (>2000 GS Units) by Duration of Employment

Ever in a room >2,000 GS units	Employed 10+ years	Total teachers	Cancers observed	Cancers expected	Risk ratio (O/E)	Poisson p
Yes	Yes	10	7^{a}	0.988	7.1*	0.00007
Yes	No	30	3^{a}	0.939	3.2	0.054
Total		40	10	1.93	5.1*	0.00003
No	Yes	19	2	1.28	1.6	0.22
No	No	78	6	3.25	1.8	0.063
Total		97	8	4.56	1.8*	0.047
Grand total		137	18	6.49	2.8*	0.000098

^{a}One teacher had two primary cancers.
*$P < 0.05$

A positive dose-response was seen between the risk of cancer and the cumulative GS exposure (Table V). Three categories of cumulative GS unit-years of exposure were selected: <5,000, 5,000 to 10,000, and more than 10,000 cumulative GS unit-years. We found elevated risk ratios of 2.0, 5.0, and 4.2, respectively, all statistically significant, for each category. There was a positive trend of increasing cancer incidence with increasing cumulative GS unit-years of exposure ($P = 7.1 \times 10^{-10}$). An exposure of 1,000 GS unit-years increased a teacher's cancer risk by 13%. Working in a room with a GS overload (≥2,000 GS units) for 1 year increased cancer risk by 26%.

An attributable risk percentage was calculated: (observed cancers-expected cancers)/observed cancers = (18 − 6.51)/18 = 63.8%.

The fact that these cancer incidence findings were generated by a single day of G/S meter readings made on June 8, 2006 suggests that the readings were fairly constant over time since the school was built in 1990. For example, if the 13 classrooms which overloaded the meter on June 8, 2006 were not the same since the start of the study and constant throughout, the cancer risk of teachers who ever worked in the overload rooms would have been the same as the teachers who never worked in an overload room.

Although teachers with melanoma and cancers of the thyroid, and uterus, had very high, statistically significant risk ratios, there was nothing exceptional about their age at hire, duration of employment, or cumulative GS exposure. However, thyroid cancer and melanoma had relatively short latency times compared to the average latency time for all 18 cancers. The average latency time between start of

TABLE V. Observed and Expected Cancers by Cumulative GS Exposure (GS Unit Years)

Exposure group	< 5,000 GS unit-years	5,000 to 10,000	> 10,000 GS unit-years	Total
Average GS unit-years	914	7,037	15,483	
Cancers obs.	9	4	5	18
Cancers exp.	4.507	0.799	1.20	6.49
Risk ratio (O/E)	2.01*	5.00*	4.17*	2.78*
Poisson p	0.0229	0.0076	0.0052	0.000098

Positive trend test (Chi square with one degree of freedom = 38.0, $P = 7.1 \times 10^{-10}$).
*$P < 0.05$

employment at the school and diagnosis for all cancers was 9.7 years. The average latency time for thyroid cancer was 3.0 years and for melanoma it was 7.3 years (with three of the four cases diagnosed at 2, 3, and 5 years).

An independent analysis of this data set by the University of Pittsburgh School of Public Health using OCMAP software supported our findings.

DISCUSSION

Because of access denial, we have no information about the source, or characterization of the high frequency voltage transients. We can assume, because the school uses metal conduit to contain the electrical wiring, that any resultant radiated electric fields from these high frequency voltage transients would radiate mainly from the power cords and from electrical equipment using the power cords within a classroom.

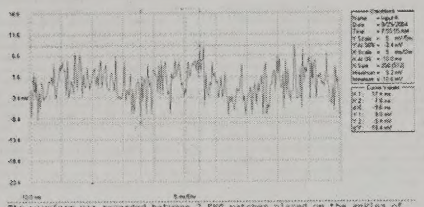
The school's GS readings of high frequency voltage transients are much higher than in other tested places (Table I). Also, teachers in the case school who were employed for over 10 years and who had ever worked in a room with an overload GS reading had a much higher rate of cancer. They made up 7.3% of the cohort but experienced 39% of all cancers.

The relatively short latency time of melanoma and thyroid cancers suggests that these cancers may be more sensitive to the effects of high frequency voltage transients than the other cancers seen in this population.

In occupational cohort studies, it is very unusual to have a number of different cancers with an increased risk. An exception to this is that cohorts exposed to ionizing radiation show an increased incidence of a number of different cancers. The three cancers in this cohort with significantly elevated incidence, malignant melanoma, thyroid cancer and uterine cancer, also have significantly elevated incidence in the large California school employees cohort [Reynolds et al., 1999].

These cancer risk estimates are probably low because 23 of the 137 members of the cohort remain untraced. Since exposure was calculated based on 7 days a week for a year, this will overstate the actual teachers' exposure of 5 days a week for 9 months a year.

We could not study field exposures in the classrooms since we were denied access to the school. We postulate that the dirty power in the classroom wiring exerted its effect by capacitive coupling which induced electrical currents in the teachers' bodies. The energy that is capacitively coupled to the teachers' bodies is proportional to the frequency. It is this characteristic that highlights the usefulness of the G/S meter. High frequency dirty power travels along the electrical distribution system in and between buildings and through the ground. Humans and conducting objects in contact with the ground become part of the circuit. Figure 2 [Havas and Stetzer, 2004, reproduced with permission] shows an oscilloscope tracing taken between EKG patches on the ankles of a man wearing shoes, standing at a kitchen sink. The 60 Hz sine wave is distorted by high frequencies, which allows high frequency currents to oscillate up one leg and down the other between the EKG patches.



The waveform was recorded between 2 EKG patches placed on the ankles of XXXXXX XXXXXXXXX standing in front of his kitchen sink at his home near Bright Ontario. It shows a distorted 60 cycle sine wave containing high frequencies applied to each foot, allowing high frequency current to freely oscillate up one leg and down the other. XXXXXX has been diagnosed with prostrate cancer since moving to the house in less than a year. He was standing with feet shoulder width apart, wearing shoes, at the time of the readings. The amplitude increased as the feet were placed farther apart.

FIGURE 2. Oscilloscope display of 60 Hz current waveform with high frequencies taken between EKG patches applied to the ankles of a man standing with shoes on at a kitchen sink. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

Although not demonstrated in this data set, dirty power levels are usually higher in environments with high levels of 60 Hz magnetic fields. Many of the electronic devices which generate magnetic fields also inject dirty power into the utility wiring. Magnetic fields may, therefore, be a surrogate for dirty power exposures. In future studies of the EMF-cancer association, dirty power levels should be studied along with magnetic fields.

The question of cancer incidence in students who attended La Quinta Middle School for 3 years has not been addressed.

CONCLUSION

The cancer incidence in the teachers at this school is unusually high and is strongly associated with exposure to high frequency voltage transients. In the 28 years since electromagnetic fields (EMFs) were first associated with cancer, a number of exposure metrics have been suggested. If our findings are substantiated, high frequency voltage transients are a new and important exposure metric and a possible universal human carcinogen similar to ionizing radiation.

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A Summary of new evidence:

Adverse health effects and industrial wind turbines

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To whom it may concern

In previous communications, evidence has been provided regarding the risk of adverse health effects and industrial wind turbines (IWTs). Up to now, the siting of IWTs in Ontario is based on predictive computer modelling. While there is ample evidence regarding adverse health effects, the conduct of human health studies to determine regulations for setbacks and noise levels that protect health is still lacking.

The purpose of this document is to inform authorities and decision makers of new evidence, including articles published in peer reviewed scientific journals which advance knowledge on the topic of adverse health effects of IWTs.

Based on the evidence compiled in this document, no further IWT projects should be approved in proximity to humans until human health studies are conducted to determine setbacks and noise levels that will ensure the health and welfare of all exposed individuals.

Furthermore where there are reports of adverse health and/or noise complaints IWTs should be decommissioned until the human health studies have been conducted to determine regulations for setbacks and noise levels that protect health.

This summary may be used and submitted by other individuals.

No financial compensation has been requested nor received for this summary.

Denial of adverse health effects

For years now, the Canadian Wind Energy Association (CanWEA) has denied that wind turbines can cause adverse health effects. However, based on previously known and recent information, this denial is incorrect.

A 2008 CanWEA media release informs the world "Scientists conclude that there is no evidence that wind turbines have an adverse impact on human health." [1] None of references included in this CanWEA media release state "there is no evidence that wind turbines have an adverse impact on human health."

An April 2009 CanWEA fact sheet states "Findings clearly show that there is no peer-reviewed scientific evidence indicating that wind turbines have an adverse impact on human health." [2] The fact sheet contains eight references, none of which state "there is no peer-reviewed scientific evidence indicating that wind turbines have an adverse impact on human health."

A 2009 CanWEA convened literature review concludes "Sound from wind turbines does not pose a risk of hearing loss or any other adverse health effect in humans." [3] However, the contents of the literature review contradict this conclusion by acknowledging IWT noise may cause annoyance, stress and sleep disturbance and as a result people may experience adverse physiological and psychological symptoms. The literature review acknowledges possible symptoms include distraction, dizziness, eye strain, fatigue, feeling vibration, headache, insomnia, muscle spasm, nausea, nose bleeds, palpitations, pressure in the ears or head, skin burns, stress, and tension.

The above CanWEA sponsored statements which deny risk of adverse health effects are scientifically incorrect.

Assertions that IWTs do not pose a risk to human health only serve to confuse authorities and the public on the issue wind turbines and health effects.

For example, Ontario Minister of Health Matthews reportedly stated "There is no evidence, whatsoever, that there is an issue related to turbines," [4] This statement is scientifically incorrect.

July 2011 Environmental Review Tribunal (ERT) Decision, Ontario

As noted above, the CanWEA sponsored Colby et al. (2009) literature review stated "Sound from wind turbines does not pose a risk of hearing loss or any other adverse health effect in humans." [5] Three of the co-authors of this statement, Drs. Colby, Leventhall, and McCunney testified on behalf of the Respondents (Ministry of Environment, Suncor Energy Services Inc.) during an Ontarian Environmental Review Tribunal (ERT).

Evidence provided at the ERT demonstrated the above statement authored by the CanWEA sponsored panel experts is incorrect.

The July 2011 ERT decision for an IWT project in Ontario [6] confirmed IWTs can harm humans:

> "While the Appellants were not successful in their appeals, the Tribunal notes that their involvement and that of the Respondents, has served to advance the state of the debate about wind turbines and human health. This case has successfully shown that the debate should not be simplified to one about whether wind turbines can cause harm to humans. *The evidence presented to the Tribunal demonstrates that they can, if facilities are placed too close to residents. The debate has now evolved to one of degree."* (p. 207) (*Emphasis added*)

Evidence and testimony provided to the ERT by witnesses called by the Appellants served to advance understanding of IWT induced health impacts. It is now acknowledged that IWTs do pose a risk of adverse health effect in humans if they are improperly sited.

All ten of the witnesses called upon by the Appellants were qualified as expert witnesses. The expert witnesses called upon by the Appellants have been involved in original

research on the health effects of IWTs and/or have had related articles accepted in peer reviewed scientific journals.

During the ERT expert witnesses for both the Respondents and the Appellants provided evidence and/or testimony which acknowledged IWTs sound is perceived to be more annoying than transportation noise or industrial noise at comparable sound pressure levels.

Peer reviewed articles and other references acknowledge annoyance to be an adverse health effect. (Pedersen & Persson Waye, 2007 [7]; Michaud et al. 2005 [8]; Health Canada, 2005 [9], Suter, 1991 [10])

During the ERT expert witnesses for both the Respondents [11], [12], [13], [14] and the Appellants provided evidence and/or testimony which acknowledge annoyance to be a health effect.

Research confirms for chronically strong annoyance a causal chain exists between the three steps health–strong annoyance–increased morbidity [15] and must be classified as a serious health risk. [16]

During the ERT expert witnesses for both the Respondents and the Appellants provided evidence and/or testimony which acknowledged IWTs "will" cause annoyance, which can result in stress related health impacts including sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory, and panic episodes associated with sensations of internal pulsation or quivering when awake or asleep, and depression.

During the ERT witnesses for both the Respondents and/or the Appellants provided evidence and/or testimony which indicate plausible causes of these health effects include: IWT amplitude modulation, audible low frequency sound, infrasound, tonality, lack of nighttime abatement, shadow flicker, visual impact, economic impacts or a combination thereof.

It is acknowledged Ontario regulations and/or noise guidelines will not protect all individuals from these health impacts. A 2010 final draft report prepared for the Ontario Ministry of Environment (MOE) states:

> "The audible sound from wind turbines, at the levels experienced at typical receptor distances in Ontario, *is nonetheless expected to result in a non-trivial percentage of persons being highly annoyed*. As with sounds from many sources, research has shown that annoyance associated with *sound from wind turbines can be expected to contribute to stress related health impacts in some persons*." [17] (*Emphasis added*)

MOE documents obtained through a Freedom of Information request confirm current Ontario IWT guidelines will cause adverse effects. One 2010 MOE internal memorandum states:

> "It appears compliance with the minimum setbacks and the noise study approach currently being used to approve the siting of WTGs will result or likely result in adverse effects contrary to subsection 14(1) of the EPA" [18]

Another MOE reference documents Ontario families that have abandoned their homes due to sleep disturbance caused by exposure to wind farms. [19] Sleep disturbance is an adverse health effect. MOE correspondence also documents families that have moved out of their homes and have made financial settlements with the respective IWT developer. [20]

Based on original research in Ontario, and elsewhere, a peer reviewed article states:

> "It is acknowledged that IWTs, if not sited properly, can adversely affect the health of exposed individuals. In addition to physiological and psychological symptoms there are individuals reporting adverse impacts, including reduced well-being, degraded living conditions, and adverse societal and economic impacts. These adverse impacts culminate in expressions of a loss of fairness and social justice.
>
> The above impacts represent a serious degradation of health in accordance with commonly accepted definitions of health as defined by the WHO and the Ottawa Charter for Health Promotion." [21]

August 2011 peer reviewed articles published in a scientific journal

Subsequent to the July Ontario ERT decision nine peer reviewed articles have been published in a special August, 2011 edition of the scientific journal, *Bulletin of Science, Technology and Society* (*BSTS*). These articles explore health and social impacts of IWT installations. [22], [23], [24], [25], [26], [27], [28], [29], [30]

The Special Edition is entitled *Windfarms, Communities and Ecosystems*. Included in the special edition, is a commentary by the editor, Willem H. Vanderburg. [31]

The SAGE website states:

> *"The goal of the* ***Bulletin of Science, Technology and Society*** *is to provide a means of communication within as wide of a spectrum of the STS community as possible. This includes faculty and students from sciences, engineering, the humanities, and social science in the newly emerging groups on university and college campuses, and in the high school systems, all of which teach integrative STS subject matters. It also includes professionals in government, industry and universities, ranging from philosophers and historians of science to social scientists concerned with the effects*

> *of science and technology, scientists and engineers involved with the study and policy-making of their own craft, and the concerned general leader. A third category of readers represents "society": all journalists dealing with the impacts of science and technology in their respected fields, the public interest groups and the attentive public."* [32]

One article presents the result of WindVOiCe, an Ontario self reporting health survey that follows the principles of Health Canada for vigilance monitoring of pharmaceuticals and other products. [33]

Another article documents social justice impacts when people cannot obtain mitigation or resolution and in some cases, have abandoned their homes due to IWT exposure. [34]

An article authored by Dr. Bob Thorne documents his research on IWT noise and correlates this with reported IWT adverse health impacts. Based this field work Dr. Thorne concludes a sound level of LAeq 32 dB outside the residence is required to avoid serious harm to human health. [35]

Ontario MOE documents obtained from a Freedom of Information request support a 32 dBA sound limit for IWTs. Based on real world field investigations MOE field officers advised the Ministry about IWT adverse effects and stated "… the setback distances should be calculated using a sound level limit of 30 to 32 dBA at the receptor, instead of the 40 dBA sound level limit." [36]

Dr. Robert McMurtry, former Dean of Medicine, University of Western Ontario, and 2011 recipient of Member of Order of Canada, published a case definition to facilitate a clinical diagnosis regarding adverse health effects and IWTs. [37]

Other articles explore topics including how to properly interpret IWT epidemiological evidence, [38] the physics of IWT noise, [39] public health ethics, [40] potential IWT noise impacts on children, [41] and potential IWT infrasound sound impacts on the human ear. [42]

These articles are critical to anyone interested in the safe siting of IWTs. It is recommended that authorities and regulators obtain a copy of each of the nine articles.

Please use this link if you wish to access these articles http://bst.sagepub.com

Downloads of these articles can be obtained with an individual subscription for $100. This will allow you to download these and other articles from the BSTS scientific journal.

IWT low frequency noise and infrasound

In the past some commentators have stated low frequency noise from IWTs is not an issue. Other references indicate most available evidence suggests that reported IWT health effects, such as sleeplessness and headache, are related to audible low frequency noise. [43]

A June 2011 Federal Australian Senate committee investigating IWT and adverse health effects report recommended:

> "... noise standards adopted by the states and territories for the planning and operation of rural wind farms should include appropriate measures to calculate the impact of low frequency noise and vibrations indoors at impacted dwellings." [44]

A June 2011 peer reviewed article on IWT low frequency noise is available. [45]

The abstract states:

> As wind turbines get larger, worries have emerged that the turbine noise would move down in frequency and that the low-frequency noise would cause annoyance for the neighbors. The noise emission from 48 wind turbines with nominal electric power up to 3.6 MW is analyzed and discussed. The relative amount of low-frequency noise is higher for large turbines (2.3–3.6 MW) than for small turbines ([1] 2 MW), and the difference is statistically significant. The difference can also be expressed as a downward shift of the spectrum of approximately one-third of an octave. A further shift of similar size is suggested for future turbines in the 10-MW range. Due to the air absorption, the higher low-frequency content becomes even more pronounced, when sound pressure levels in relevant neighbor distances are considered. Even when A-weighted levels are considered, a substantial part of the noise is at low frequencies, and for several of the investigated large turbines, the one-third-octave band with the highest level is at or below 250 Hz. It is thus beyond any doubt that the low-frequency part of the spectrum plays an important role in the noise at the neighbors."

Annoyance from audible low frequency noise is acknowledged to be more severe in general. Low frequency noise does not need to be considered load for it to cause annoyance and irritation. [46] Low frequency noise causes immense suffering to those who are unfortunate to be sensitive to it [47] and chronic psychophysiological damage may result from long-term exposure to low-level low frequency noise. [48] Some symptoms associated with exposure to low frequency noise include annoyance, stress, sleep disturbance, headaches, difficulty concentrating, irritability, fatigue, dizziness or vertigo, tinnitus, anxiety, heart ailments and palpitation. [49], [50], [51]

Møller and Pedersen, (2011) indicate IWT low frequency noise is more of an issue for large turbines of 2.3 MW and up. [52] However low frequency noise from smaller turbines (ie 1.5MW) can also cause adverse health effects. Freedom of Information documents

> effects considerably. When prominent low-frequency components are present, measures based on A-weighting are inappropriate." [61]

Consultants for the Ontario MOE, Aercoustics, submitted a paper at the Fourth International Meeting on Wind Turbine Noise which states:

> "Sound emissions from operating wind farms frequently give rise to noise complaints. Most compliance-based noise audits measure hourly "A"-weighted Leq, thereby removing the low-frequency contents of the wind turbine sound. The metric is also insensitive to amplitude modulation and is unsatisfactory when sensitive receptor are annoyed by the low frequency sound and amplitude modulation." [62]

Current Ontario guidelines are based on the A-Weighted Leq metric and hence must be considered unsatisfactory to protect individuals from the health impacts of IWT amplitude modulation and/or low frequency noise.

The need for research

The authors of a Canadian Wind Energy Association sponsored report state they do not "advocate for funding further studies." [63]

The April 2011 Wind Turbine Noise post-conference report states:

> "Work is required in understanding why low levels of wind turbine noise may produce affects which are greater than might be expected from their levels." [64]

A June 2011 Australian Senate committee investigating IWT and adverse health effects report recommended:

> "... the Commonwealth Government initiate as a matter of priority thorough, adequately resourced epidemiological and laboratory studies of the possible effects of wind farms on human health. This research must engage across industry and community, and include an advisory process representing the range of interests and concerns." [65]

The July 2011 Ontario ERT decision also acknowledged that more research is needed. [66]

> "Just because the Appellants have not succeeded in their appeals, that is no excuse to close the book on further research. On the contrary, further research should help resolve some of the significant questions that the Appellants have raised." (p. 207)

obtained from the MOE document low frequency noise issues from smaller IWTs (i.e., 1.5 MW) at Ontario wind farms. The MOE documents how IWT low frequency noise caused a home to be "uninhabitable" resulting in family members abandoning trying to sleep there. [53] For further discussion see Krogh (2011) [54] and Thorne (2011). [55]

Research on the potential impacts of IWT infrasound has been published in two peer reviewed scientific journals (Salt and Hullar, 2010 [56], Salt and Kaltenbach, 2011 [57]). These articles conclude that it is scientifically possible that infrasound from IWTs could affect people living nearby and more research is needed.

Wind Turbines Noise, Fourth International Meeting

During the Rome Conference Fourth International Meeting on Wind Turbine Noise Rome Italy 12-14 April 2011 there were a number of presentations documenting IWT noise issues.

The Wind Turbine Noise (2011) post-conference report states:

> "The main effect of daytime wind turbine noise is annoyance. The night time effect is sleep disturbance. These may lead to stress related illness in some people. Work is required in understanding why low levels of wind turbine noise may produce affects which are greater than might be expected from their levels." [58]

A number of conference papers addressed human health impacts of IWTs. For example one research team conducted a study which demonstrated those living in the immediate vicinity of IWTs scored worse than a matched control group in terms of physical and environmental health related quality of life (HRQOL). [59]

The Ontario ERT expert witnesses for both the Respondents and the Appellants provided evidence and/or testimony which acknowledged IWT amplitude modulation and/or audible low frequency noise are probable causes of IWT adverse health effects.

Research related to low frequency noise "...confirms the importance of fluctuations as a contributor to annoyance and the limitation of those assessment methods, which do not include fluctuations in the assessment." [60]

In addition, the World Health Organization states:

> "Noise measures based solely on LAeq values do not adequately characterize most noise environments and do not adequately assess the health impacts of noise on human well-being. It is also important to measure the maximum noise level and the number of noise events when deriving guideline values. If the noise includes a large proportion of low-frequency components, values even lower than the guideline values will be needed, because low-frequency components in noise may increase the adverse

International experts who have conducted original research and/or published peer reviewed articles in scientific journals confirm that research is required. [67], [68], [69], [70], [71], [72], [73], [74], [75], [76]

Inappropriate use of literature reviews

Literature reviews can be useful tools for summarizing existing literature related to a particular topic. In order to be considered reliable a literature review must be complete, accurate, and objective.

In recent years a number of literature reviews have been produced which purport to explore the health effect of IWTs. Some literature reviews which have been relied upon to deny IWTs can adversely affect the health of humans. These literature reviews include Chatham-Kent Public Health Unit, (2008), [77] Colby et al, (2009), [78] Ontario Chief Medical Officer of Health, (2010), [79] and the National Health and Medical Research Council (Australia) (2010). [80] None of these literature reviews have been published in a peer reviewed scientific journal.

Reliance on these literature reviews is inappropriate as they contain errors of omission and/or commission and are neither convincing nor authoritative. Many of the conclusions are incomplete, inaccurate, lack objectivity and consequently only serve to confuse the issue of IWT health effects.

For example, these literature reviews limit their discussion to direct effects using qualifiers such as "direct physiopathological effects" or "direct causal links". Failure to carefully evaluate the indirect causal pathways and the psychological harm of IWT exposure represent errors of omission. Annoyance, sleep disturbance, cognitive and emotional response, and stress are health effects that occur through the indirect pathway. [81] The health outcomes associated with the indirect pathway are significant:

> "Physiological experiments on humans have shown that noise of a moderate level acts via an indirect pathway and has health outcomes similar to those caused by high noise exposures on the direct pathway. The indirect pathway starts with noise-induced disturbances of activities such as communication or sleep." [82]

The Ontario Environmental Review Tribunal expressed concern that the Director for the MOE relied on references which did not address the indirect pathway. [83]

As a consequence of their weaknesses some literature reviews have been criticized for their poor quality.

In March 2011, the Chief Executive Officer of National Health and Medical Research Council stated regarding their July 2010 literature review:

> "We regard this as a work in progress. We certainly do not believe that this question has been settled. That is why we are keeping it under constant review. That is why we said in our review that we believe authorities must take a precautionary approach to this." [84]

Chatham-Kent Public Health Unit (2008), [85] Colby et al, December 2009, [86] Ontario Chief Medical Officer of Health (2010), [87] share many of the same weaknesses as National Health and Medical Research Council (2010). [88] These literature reviews cannot be relied for Renewable Energy Applications and/or Renewable Energy Approvals to support the contention there is no evidence that IWTs can cause adverse health effects. For detailed analysis of some of these literature reviews visit www.windvigilance.com

Conclusion

Based on the best available evidence the following conclusions can be made

1. The Canadian Wind Energy Association sponsored statements that IWTs do not pose a risk of adverse health effects in humans are scientifically incorrect.

2. Experts who have conducted original research and/or published peer reviewed articles in scientific journals confirm IWTs can harm human health if they not sited properly.

3. Acknowledged adverse health effects include: annoyance, stress, sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory, and panic episodes associated with sensations of internal pulsation or quivering when awake or asleep. Other adverse impacts include reduced well-being, degraded living conditions, and adverse societal and economic impacts. These adverse impacts culminate in expressions of a loss of fairness and social justice.

4. The above impacts in conclusion 3 represent a serious degradation of health in accordance with commonly accepted definitions of health as defined by the WHO and the Ottawa Charter for Health Promotion.

5. It is expected that at typical setbacks and with the noise study approach currently being used in Ontario to approve the siting of IWTs, a non trivial percentage of exposed individuals will experience serious degradation of health.

6. Harm to human health can be avoided with science based regulations based on research conducted on human response to IWT exposure.

7. Experts who have conducted original research and/or published peer reviewed articles in scientific journals confirm that research is required to establish scientifically based IWT regulations to protect human health.

8. Until scientifically based research has been conducted IWTs should not sited in proximity to human habitation.

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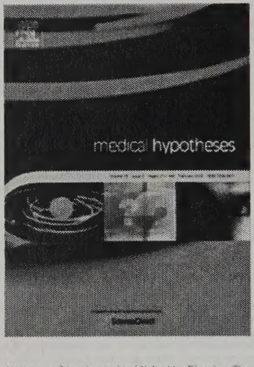

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Historical evidence that electrification caused the 20th century epidemic of "diseases of civilization"[☆]

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SUMMARY

The slow spread of residential electrification in the US in the first half of the 20th century from urban to rural areas resulted by 1940 in two large populations: urban populations, with nearly complete electrification and rural populations exposed to varying levels of electrification depending on the progress of electrification in their state. It took until 1956 for US farms to reach urban and rural non-farm electrification levels. Both populations were covered by the US vital registration system. US vital statistics tabulations and census records for 1920–1960 and historical US vital statistics documents were examined. Residential electrification data was available in the US census of population for 1930, 1940 and 1950. Crude urban and rural death rates were calculated, and death rates by state were correlated with electrification rates by state for urban and rural areas for 1940 white resident deaths. Urban death rates were much higher than rural rates for cardiovascular diseases, malignant diseases, diabetes and suicide in 1940. Rural death rates were significantly correlated with level of residential electric service by state for most causes examined. I hypothesize that the 20th century epidemic of the so called diseases of civilization including cardiovascular disease, cancer and diabetes and suicide was caused by electrification not by lifestyle. A large proportion of these diseases may therefore be preventable.

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Background

In 2001, Ossiander and I [1] presented evidence that the childhood leukemia mortality peak at ages 2–4 which emerged in the US in the 1920s was correlated with the spread of residential electrification in the first half of the 20th century in the US. While doing the childhood leukemia study, I noticed a strong positive correlation between level of residential electrification and the death rate by state due to some adult cancers in 1930 and 1940 vital statistics. At the time, a plausible electrical exposure agent and a method for its delivery within residences was lacking. However, in 2008 I coauthored a study of a cancer cluster in school teachers at a California middle school [2], which indicated that high frequency voltage transients (also known as dirty electricity), were a potent universal carcinogen with cancer risks over 10.0 and significant dose-response for a number of cancers. They have frequencies between 2 and 100 kHz. These findings are supported by a large cancer incidence study in 200,000 California school employees which showed that the same cancers and others were in excess in California teachers statewide [3]. Power frequency magnetic fields (60 Hz) measured at the school were low and not related to cancer incidence, while classroom levels of high frequency voltage transients measured at the electrical outlets in the classrooms accurately predicted a teacher's cancer risk. These fields are potentially present in all wires carrying electricity and are an important component of ground currents returning to substations especially in rural areas. This helped explain the fact that professional and office workers, like the school teachers, have high cancer incidence rates. It also explained why indoor workers had higher malignant melanoma rates, why melanoma occurred on part of the body which never are exposed to sunlight, and why melanoma rates are increasing while the amount of sunshine reaching earth is stable or decreasing due to air pollution. A number of very different types of cancer had elevated risk in the La Quinta school study, in the California school employees study, and in other teacher studies. The only other carcinogenic agent which acts like this is ionizing radiation.

Among the many devices which generate the dirty electricity are compact fluorescent light bulbs, halogen lamps, wireless routers, dimmer switches, and other devices using switching power supplies. Any device which interrupts current flow generates dirty electricity. Arcing, sparking and bad electrical connections can also generate the high frequency voltage transients. Except for the dimmer switches, most of these devices did not exist in the first half of the 20th century. However, early electric generating equipment

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and electric motors used commutators, carbon brushes, and split rings, which would inject high frequency voltage transients into the 60 Hz electricity being generated and distributed.

With a newly recognized electrical exposure agent and a means for its delivery, I decided to examine whether residential electrification in the US in the first half of the last century was related to any other causes of death. Most cancers showed increasing mortality in this period, and many are still increasing in incidence in the developed world.

Thomas Edison began electrifying New York City in 1880, but by 1920, only 34.7% of all US dwelling units and 1.6% of farms had electric service (Table 1). By 1940, 78% of all dwelling units and 32% of farms had electric service [4]. This means that in 1940 about three quarters of the US population lived in electrified residences and one quarter did not. By 1940, the US vital registration system was essentially complete, in that all the 48 contiguous United States were included. Most large US cities were electrified by the turn of the century, and by 1940, over 90% of all the residences in the northeastern states and California were electrified. In 1940 almost all urban residents in the US were exposed to electromagnetic fields (EMFs) in their residences and at work, while rural residents were exposed to varying levels of EMFs, depending on the progress of rural electrification in their states. In 1940, only 28% of residences in Mississippi were electrified, and five other southern states had less than 50% of residences electrified (Table 2). Eleven states, mostly in the northeast had residential electrification rates above 90%. In the highly electrified northeastern states and in California, urban and rural residents could have similar levels of EMF exposure, while in states with low levels of residential electrification, there were potentially great differences in EMF exposure between urban and rural residents. It took the first half of the 20th century for these differences to disappear. I examined US mortality records by urban and rural residence by percent of residences with electric service by state.

Hypothesis

The diseases of civilization or lifestyle diseases include cardiovascular disease, cancer and diabetes and are thought to be caused by changes in diet, exercise habits, and lifestyle which occur as countries industrialize. I think the critical variable which causes the radical changes in mortality accompanying industrialization is electrification. Beginning in 1979, with the work of Wertheimer and Leeper [5], there has been increasing evidence that some facet of electromagnetic field exposure is associated epidemiologically with an increased incidence of leukemia, certain other cancers and non-cancers like Alzheimer's disease, amyotrophic lateral sclerosis, and suicide. With the exception of a small part of the electromagnetic spectrum from infra red through visible light, ultraviolet light and cosmic rays, the rest of the spectrum is man-made and foreign to human evolutionary experience. I suggest that from the time that Thomas Edison started his direct current electrical distribution system in the 1880s in New York City until now, when most of the world is electrified, the electricity carried high frequency voltage transients which caused and continue to cause what are considered to be the normal diseases of civilization. Even today, many of these diseases are absent or have very low incidence in places without electricity.

Table 1
Growth of residential electric service US 1920–1956 percent of dwelling units with electric service.

Year	All		Urban and rural non farm
	Dwellings	Farm	
1920	34.7	1.6	47.4
1925	53.2	3.9	69.4
1930	68.2	10.4	84.8
1935	68.0	12.6	83.9
1940	78.7	32.6	90.8
1945	85.0	48.0	93.0
1950	94.0	77.7	96.6
1956	98.8	93.9	99.2

Table 2
Percent of residences with electric lighting 1930 and 1940 by state.

Code	State	1930	1940
AL	Alabama	33.9	43.3
AZ	Arizona	66.8	74.5
AR	Arkansas	25.5	32.8
CA	California	94.9	96
CO	Colorado	69.6	77.6
CT	Connecticut	93.3	96.5
DE	Delaware	78.3	81.8
FL	Florida	60.9	68.7
GA	Georgia	35.5	48.6
ID	Idaho	66.5	79.3
IL	Illinois	90.1	84.9
IN	Indiana	74.8	83
IA	Iowa	65.6	76.7
KS	Kansas	62	71.5
KY	Kentucky	44.3	54.3
LA	Louisiana	42.2	48.9
ME	Maine	76.1	84.4
MD	Maryland	81.8	85.9
MA	Massachusetts	97.1	97.6
MI	Michigan	84.8	92.3
MN	Minnesota	65.9	75.8
MS	Mississippi	19.5	28.3
MO	Missouri	65.5	74.6
MT	Montana	58.2	74.2
NE	Nebraska	64	74.5
NV	Nevada	76.2	89.8
NH	New Hampshire	84.9	87
NJ	New Jersey	95.6	96.6
NM	New Mexico	39.8	49.7
NY	New York	94.5	96.4
NC	North Carolina	40.5	50.4
ND	North Dakota	41.6	53.8
OH	Ohio	89.2	90.6
OK	Oklahoma	45.4	55.1
OR	Oregon	79.1	85.8
PA	Pennsylvania	89.5	92.3
RI	Rhode Island	97.3	97.7
SC	South Carolina	34.3	38.2
SD	South Dakota	44.3	58.8
TN	Tennessee	42	58.0
TX	Texas	*	59
UT	Utah	88.4	93.9
VT	Vermont	73.8	84.2
VA	Virginia	50.5	66.6
WA	Washington	86.3	90.9
WV	West Virginia	63.4	69.1
WI	Wisconsin	73.5	83.9
WY	Wyoming	60	70.9

*No data.

Evaluation of the hypothesis

To evaluate the hypothesis, I examined mortality in US populations with and without residential electrification. Vital statistics tabulations of deaths [6], US census records for 1920–1970 [7], and historical US documents [8,9] were examined in hard copy or downloaded from the internet. The same state residential electrification data used in the childhood leukemia study [1] was used in this study. Crude death rates were calculated by dividing number of deaths by population at risk, and death rates by state were then correlated with electrification rates by state using downloaded software [10]. Time trends of death rates for selected causes of death by state were examined. Most rates were calculated by state for urban and rural residence for whites only in 1940 deaths, since complete racial data was available by urban/rural residence by state for only 13 of 48 states. Data was available for 48 states in the 1960 mortality tabulations. District of Columbia was excluded because it was primarily an urban population. Excel graphing software [11] and "Create a Graph" [12] software was used.

I had hoped to further test this hypothesis by studying mortality in individual US farms with and without electrification, when the 1930 US census 70 year quarantine expired in 2000. Unfortunately, the 1930 US farm census schedules had been destroyed.

Findings

Rural residential electrification did not reach urban levels until 1956 (Table 1). Table 2 shows the level of residential electrification for each state for 1930 and 1940. In 1930 and 1940 only 9.5% and 13%, respectively, of all generated electricity was used in residences. Most electricity was used in commercial and industrial applications.

Figs. 1–4 were copied and scanned from "Vital statistics rates in the United States 1940–1960", by Robert Grove Ph.D. and Alice M. Hetzel. This volume was published in 1968. Fig. 1 shows a gradual decline in the all causes death rate from 1900 to 1960 except for a spike caused by the 1918 influenza pandemic. Death rates due to tuberculosis, typhoid fever, diphtheria, dysentery, influenza and pneumonia and measles all fell sharply in this period, and account for most of the decline in the all causes death rate. Figs. 2–4 show that in the same time period when the all causes death rate was declining, all malignant neoplasms (Fig. 2), cardiovascular diseases (Fig. 3), and diabetes (Fig. 4) all had gradually increasing death rates. In 1900, heart disease and cancer were 4th and 8th in a list of 10 leading causes of death. By 1940 heart disease had risen to first and cancer to second place, and have maintained that position ever since. Table 3 shows that for all major causes of death examined, except motor vehicle accidents, there was a sizable urban excess in 1940 deaths. The authors of the extensive 89 page introduction to the 1930 mortality statistics volume noted that the cancer rates for cities were 38.2% higher than those for rural areas. They speculated that some of this excess might have been due to rural residents dying in urban hospitals. In 1940, deaths by place of residence and occurrence are presented in separate volumes. In 1940 only 2.1% of all deaths occurred to residents of one state dying in another state. Most non-resident deaths were residents of other areas of the same state. Table 4 presents correlation coefficients for the relationship between death rates by urban/rural areas of each state and the percent of residences in each state with electric service. In 1940 urban and rural residence information was not available for individual cancers as it was in 1930, but death rates for each cancer were available by state. They were used to calculate correlations between electric service by state and respiratory cancer, breast cancer and leukemia mortality.

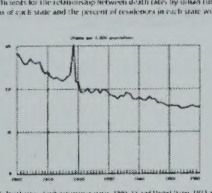

Fig. 1. Death rates: death registration states, 1900–32 and United States 1933–60.

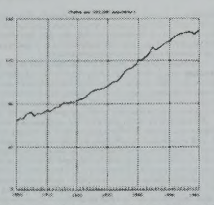

Fig. 2. Death rates for malignant neoplasms: death registration states, 1900–32, and United States, 1933–60.

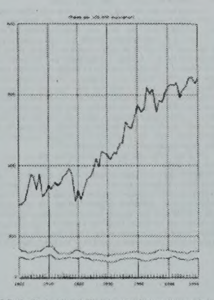

Fig. 3. Death rates for major cardiovascular renal diseases: death registration states, 1900–32, and United States, 1933–60.

All causes of death

There was no correlation between residential electrification and total death rate for urban areas, but there was a significant

correlation for rural areas (r = 0.659, p = <0.0001). Fig. 5 shows the 1940 resident white death rates for urban and rural areas of states having greater than 96% of residences electrified and states having less than 50% of residences electrified. In the highly electrified states, urban and rural death rates were similar, but in low electrification states, the urban death rates were systematically higher than the rural death rates. The urban death rates were similar in both high and low electrification states.

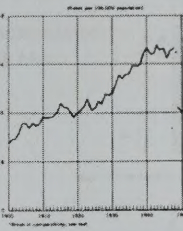

Fig. 4. Death rates for diabetes mellitus: death registration states, 1900–32 and United States, 1933–60.

All malignant neoplasms

In 1940, the urban total cancer rate was 49.2% higher than the rural rate. Both urban and rural cancer deaths rates were significantly correlated with residential electrification. Fig. 6 shows the 1940 resident white total cancer rates for urban and rural areas of states having greater than 96% of residences electrified and states having less than 50% of residences electrified. Four of the five high electrification states had similar urban and rural total cancer rates, while all the low electrification states had urban rates about twice as high as rural rates. Both urban and rural total cancer rates were lower in low electrification states than in high electrification states. Fig. 7 shows the time trend of the total cancer rate between 1920 and 1960 for Massachusetts (1940 electrification rate = 97.6%) and Louisiana (1940 electrification rate = 48.9%). The Massachusetts cancer rate was about twice that of Louisiana between 1920 and 1945. The Massachusetts rate leveled off in 1945, but the Louisiana rate increased steadily between 1920 and 1960. A declining urban–rural gradient for cancer is still evident in 1980–1990 US cancer incidence data [13]. Swedish investigators [14] have reported increasing cancer mortality and incidence time trend breaks in the latter half of the 20th century.

Table 3
1940 US white resident crude death rates per 100,000 by urban/rural residence.

Cause of death	ICD Nos.ᵃ	Urban rate	Rural rate	(%) Urban excess
All	1-200	1124.1	929.5	20.9
All cancers	47-55	145.8	97.7	49.2
Coronary disease	94	92.4	69.3	33.3
Other diseases of heart	90b,91,92a,b,c,e 93a,b,c,e 95a,b	212.0	162.8	30.2
Diabetes	61	33.2	20.0	66.0
Suicide	163-164	17.1	13.3	28.5
Motor vehicle accidents	170	26.6	26.3	1.1

ᵃ 1938 Revision International classification of disease.

Table 4
Correlation coefficients of 1940 crude US death rates by state by electrification for white resident deaths.

Cause	ICD Nos.ᵃ	Residence	r	r²	p One tailed	Slope	Y intercept
All causes	1-200	Urban	0.084	0.007	0.285	0.007	11.114
		Rural	0.659	0.434	<0.0001	0.070	4.387
All cancers	47-55	Urban	0.667	0.445	<0.0001	0.683	75.970
		Rural	0.758	0.575	<0.0001	1.302	-16.360
Respiratory cancerᵇ	47	State	0.611	0.373	<0.0001	0.071	1.026
Breast cancer female	50	State	0.794	0.630	<0.0001	0.370	-1.506
Diabetes	61	Urban	0.666	0.443	<0.0001	0.378	8.366
		Rural	0.684	0.468	<0.0001	0.346	-6.184
Leukemiaᵇ	72a	State	0.375	0.140	0.0047	0.023	1.399
Coronary artery disease	94	Urban	0.400	0.160	0.0024	0.408	61.770
		Rural	0.784	0.616	<0.0001	1.232	25.319
Other diseases of the heart	90b, 91 92a,b,c 93a,b,c,e 95a,c	Urban	0.449	0.202	0.0006	1.230	100.35
		Rural	0.790	0.619	<0.0001	2.487	-48.083
Suicide	163-4	Urban	0.077	0.006	0.2993	0.028	18.235
		Rural	0.729	0.532	<0.0001	0.331	0.290
Motor vehicle accidents	170	Urban	-0.235	0.055	0.0408	-0.171	44.572
		Rural	0.541	0.293	0.0006	0.395	12.330

ᵃ International classification of diseases 1938 revision.
ᵇ Age adjusted death rate both sexes.

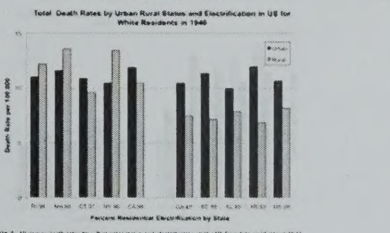

Fig. 5. All causes death rates by urban rural status and electrification in the US for white residents in 1940.

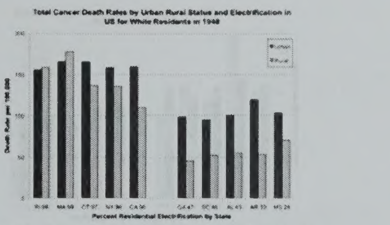

Fig. 6. Total cancer death rates by urban rural status and electrification in the US for white residents in 1940.

Respiratory cancer

No urban rural information was available for respiratory cancer, but the correlation between residential electrification and state death rates was r = 0.611; p = <0.0001. This cancer is etiologically strongly related to cigarette smoking, so the correlation with electrification is surprising. A large electrical utility worker cohort study found a high respiratory cancer incidence related to high frequency EMF transient exposure independent of cigarette smoking with a significant dose–response relationship [15].

Breast cancer

Although urban/rural information was not available for breast cancer, the 1940 state breast cancer death rates have a correlation of r = 0.794; p = <0.0001 with residential electrification. Fig. 8 shows the typical time trend of breast cancer death rates for a state with a high level of electrification (96%) and one with a low level of electrification (<50) in 1940. The California breast cancer death rate increased from 1920 to 1940, and then gradually decreased until 1960. The Tennessee breast cancer death rate is less than half of the California rate in 1920 and continues a steady increase until 1960.

Diabetes

This cause has a 66% urban excess. In spite of this, the correlation coefficients for urban and rural areas are similar at r = 0.66; p = <0.0001. There is some animal and human evidence that EMFs can effect insulin production and blood glucose levels [16]. Fig. 9

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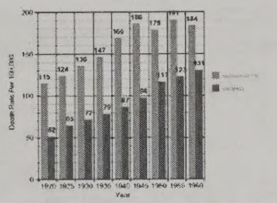

Fig. 7. US white resident total cancer death rates for Massachusetts (97.8% elect.) and Louisiana (48.9% elect.) by year.

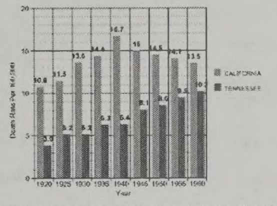

Fig. 8. US white resident breast cancer death rates for California (98% elect.) and Tennessee (58% elect.) by year.

shows that in states with low levels of electrification in 1940, the urban diabetes death rates are consistently higher than the rural rates, but are always lower than the urban and rural rates in the high electrification states.

Leukemia

Since the childhood leukemia age peak is strongly associated with residential electrification, it was interesting that the all leukemia death rate correlation was r = 0.375; p = 0.0042. Most of these deaths are in adults and are of different types of leukemia. A study of amateur radio operators showed a selective excess only of acute myelogenous leukemia [17].

Coronary artery disease and other heart disease

These two cause groups had the same percentage urban excess (33%), and very similar patterns of urban and rural correlation coefficients with residential electrification. The urban correlations were about r = 0.4 and rural deaths had correlations of 0.78 and 0.79, respectively. Fig. 10 shows the 1940 resident white coronary artery disease death rates for urban and rural areas of states having greater than 96% of residences electrified and states having less than 50% of residences electrified. Four of the five high electrification states had similar urban and rural total cancer rates, while all the low electrification states had urban rates about twice as high as rural rates. Urban and rural coronary artery death rates were lower in low electrification states than in high electrification states.

Suicide

The urban suicide death rate is about 30% higher than the rural rate. The urban suicide rate is not correlated with residential electrification (r = 0.077, p = 0.299), but the rural death rate is correlated with 1940 state residential electrification levels (r = 0.729; p = <0.0001). Fig. 11 shows the 1940 resident white suicide for

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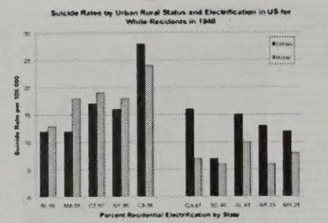

Fig. 11. Total suicide death rates by urban rural status and electrification in the US for white residents in 1940.

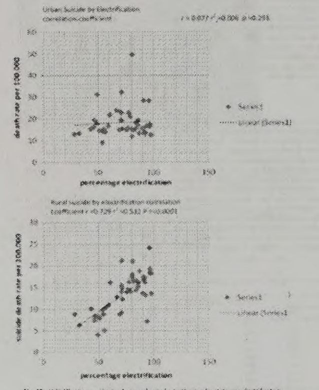

Fig. 12. 1940 US white resident urban rural suicide death rates by state and electrification.

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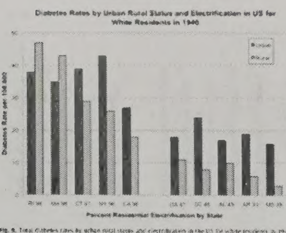

Fig. 9. Total diabetes rates by urban rural status and electrification in the US for white residents in 1940.

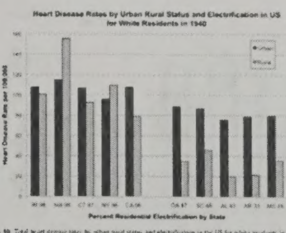

Fig. 10. Total heart disease rates by urban rural status and electrification in the US for white residents in 1940.

urban and rural areas of states having greater than 96% of residences electrified and states having less than 50% of residences electrified. In four of five high electrification states, rural suicide rates are higher than the urban rates. In all of the low electrification states, the urban rate is higher. The rural rates in the high electrification states are higher than the rural rates in the low electrification states. Fig. 12 shows X-Y scatter plots for urban and rural suicide by electrification for 48 states. Suicide has been associated with both residential [18] and occupational [19] EMF exposure. Suicide is probably the visible peak of the clinical depression iceberg.

Motor vehicle accidents

Although the mortality rates are similar in urban and rural areas, the correlations with residential electrification levels are different. There is a slight negative correlation (r = −0.258) in urban areas and a positive correlation (r = 0.451) in rural areas. Since motor vehicle fatality is related to access to a vehicle and to speed, it may be that in the larger cities it was difficult to go fast enough for a fatal accident, and in rural areas especially on farms, a farmer who could afford electrification could also afford a car.

Discussion

When Edison and Tesla opened the Pandora's box of electrification in the 1880s, the US vital registration system was primitive at best, and infectious disease death rates were falling rapidly. City residents had higher mortality rates and shorter life expectancy than rural residents [5]. Rural white males in 1900 had an expectation of life at birth of over 10 years longer than urban residents.

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Although the authors of the 1930 US vital statistics report noted a 58.2% cancer mortality excess in urban areas, it raised no red flags. The census bureau residential electrification data was obviously not linked to the mortality data. Epidemiologists in that era were still concerned with the communicable diseases.

Court Brown and Doll reported [20] the appearance of the childhood leukemia age peak in 1961, forty years after the US vital statistics mortality data on which it was based was available. I reported a cluster of childhood leukemia [21] a decade after it occurred, only because I looked for it. Real time or periodic analysis of national or regional vital statistics data is still only rarely done in the US.

The real surprise in this data set is that cardiovascular disease, diabetes and suicide, as well as cancer seem to be strongly related to level of residential electrification. A community-based epidemiologic study of urban rural differences in coronary heart disease and its risk factors was carried out in the mid 1980s in New Delhi, India and in a rural area 50 km away [22]. The prevalence of coronary heart disease was three times higher in the urban residents, despite the fact that the rural residents smoked more and had higher total caloric and saturated fat intakes. Most cardiovascular disease risk factors were two to three times more common in the urban residents. Rural electrification projects are still being carried out in parts of the rural area which was studied.

It seems unbelievable that mortality differences of this magnitude could go unexplained for over 70 years after they were first reported and 40 years after they were noticed. I think that in the early part of the 20th century nobody was looking for answers. By the time EMF epidemiology got started in 1979 the entire population was exposed to EMFs. Cohort studies were therefore using EMF-exposed population statistics to compute expected values, and case-control studies were comparing more exposed cases to less exposed controls. The mortality from lung cancer in two pack a day smokers is over 20 times that of non-smokers but only three times that of one pack a day smokers. After 1956, the EMF equivalent of a non-smoker ceased to exist in the US. An exception to this is the Amish who live without electricity. Like rural US residents in the 1940s, Amish males in the 1970s had very low cancer and cardiovascular disease mortality rates [23].

If this hypothesis and findings outlined here are even partially true, the explosive recent increase in radiofrequency radiation, and high frequency voltage transients sources, especially in urban areas from cell phones and towers, terrestrial antennas, wi-fi and wi-max systems, broadband internet over power lines, and personal electronic equipment, suggests that like the 20th century EMF epidemic, we may already have a 21st century epidemic of morbidity and mortality underway caused by electromagnetic fields. The good news is that many of these diseases may be preventable by environmental manipulation, if society chooses to.

Conflicts of interest statement

None declared.

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Perry, Cedric C

From:	Magnus von Unge <magnusvu@hotmail.com>
Sent:	Thursday, September 29, 2011 3:51 AM
To:	Perry, Cedric C
Subject:	Anza-Borrego
Categories:	Ocotillo Exp.

Dear Sir / Madam,

I heard chocking news about plans for a wind energy park in or near Anza-Borrego. I beg you to reconsider the plans. It would be dreadful to spoil such a wonderful nature as that in A-B. **P96-01**

Sincerely yours

Magnus

Magnus von Unge, MD, PhD
Professor and Consultant, Dept. of Otorhinolaryngology, Akershus University Hospital and Faculty Division Akershus University Hospital, University of Oslo, Norway
Assoc. professor, Dept. of Clinical Science, Intervention and Technology, Karolinska Institute, Stockholm, Sweden
cell phone +46 733 849463 +47 90827399

Perry, Cedric C

From: Gabriel <gabriel.vogeli@gmail.com>
Sent: Sunday, October 02, 2011 10:17 PM
To: Perry, Cedric C
Subject: I would like to urge you to put the "Wind Turbines" someplace else and not into Ocotillo ...

Categories: Ocotillo Exp.

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov

Encinitas, October 2, 2011

Dear Cedric Perry:

I am a "Paleontology Volunteer" at the Anza Borrego Desert State Park. I am frequently out in the desert surveying for fossils. I am very disturbed that the area next to the park will suddenly look like an industrial Park and in thirty years like a wasteland of decaying metal structures. I have lived before in Michigan … large industrial complexes are at the shore of Lake Michigan … decaying. The steel industry has left and so have the jobs, but a lot of the infrastructure, the mills, the railroad tracks, roads are left behind as a big wasteland. This seems also be planned for the "Wind farms". **P97-01**

Other locations:

I am sure you have a much better idea what other places would be appropriate … and available … if you put the "Wind Turbines" further west, closer to the city of San Diego, it will save a lot on long "Transmission lines", maybe even out in the ocean … or along the border with Mexico as part of the border fence. There seems to be a wide range of locations available, that will not impact the park **P97-02**

Alternative renewable energy: What are the alternatives for renewable energy? Did anybody look into a solar panel on every house … would that be cost effective? Almost no additional transmission lines. **P97-03**

Visual Impact:

Whenever I see "Wind Turbines" I wonder if they can not be designed with less of a visual impact on the landscape … I have seen cell phone towers that look like palm trees. Can they be painted in another color than white? Camouflage? **P97-04**

Impact on animals:

Are there ways to avoid harm to birds, bats and other animals. P97-05

Noise:

Can the noise be reduced? P97-06

I would like to urge you to put the "Wind Turbines" someplace else and not into Ocotillo … I hope sincerely that you can find a better place for the "Ocotillo Express Wind Turbine Project" away from the Anza Borrego Desert State Park P97-07

Respectfully yours,

Gabriel Vogeli

1448 Hymettus Ave

Encinitas CA 92024;
760 943 1033 (home), 760 994 9956 (cell)

Comment Letter P98

Perry, Cedric C

From:	marvin wayrynen <finlander@sbcglobal.net>
Sent:	Friday, September 30, 2011 8:42 PM
To:	Perry, Cedric C
Subject:	wind farm proposal, that I hope you will do the right BLM thing
Categories:	Ocotillo Exp.

Hello,
As I am quite familiar with BLM management.
I look at the wind farm as a bad blm management decision if you allow the project to continue.
I(think it would be against the Blms mandate.
To manage the land in a manner that keeps it a pristine as possible.
In the past the farmers were allowed to over graze the land and the lease agreements associated with the cattle on the land were so cheap. P98-01
Now the professionalism that I COUNT ON; went I am dealing with My needs as concerns the BLM is always encouraging and open and just plain inexpensive
to camp etc.
This wind farm abodes an erosion of California's open spaces.
Being a Native born in 1948, I just ask you to manage the not pristine
Project with a no go.
Its is bad enough that the ranchers are allowed to move cows pasture wise P98-02
where the shit they leave makes it impssible to enjoy any sort of out door adventure there.
That wind farm will destroy any part of enjoying that area in Calif.
Octillo wells and the rise to the mountains at sunrise is most fantastic.
Just please vote in a manner to not allow the project on BLM land.
I also ask you to try and count the reasons that say no against the reasons to say yes.
If you do not find more outlooks that say no, Please feel free to call this native
at
Marvin Wayrynen at 408-216-3359 24/7. P98-03
I am glad you are allowing public comment, and I do hope that the wiser and more educated BLM will not just rubber stamp such a project.
I live up here in the bay Area, the stuff we have learned as concerning our wind farms is not all rosy.
Anyway, Peace, Marv

Sam Webb

PO Box 2268
Borrego Springs, CA 92004
Phone: 760/767-0832
E-mail swebb@uia.net

August 25, 2011

Ocotillo Express Wind Energy - Public Comment

I am an environmentalist. I believe global warming is human caused and I fully support renewable energy projects to reduce CO2 emissions. But I can not support the placement of these wind generators immediately adjacent to the Anza-Borrego Desert State Park. It would destroy the desert view shed at the Park's southern entrance.

P99-01

Frederick Law Olmsted, in 1928, submitted his recommendations for a desert sanctuary in Anza-Borrego, he wrote:

Certain desert areas have a distinctive and subtle charm, in part dependent on spaciousness, solitude, and escape from the evidence of human control and manipulation of the earth, a charm of constantly growing value as the rest of the earth becomes more completely dominated by man's activities. This quality is a very vulnerable one . . . Nowhere else are casual thoughtless human changes in the landscape so irreparable, and nowhere else is it so important to control and completely protect wide areas.

Olmsted's recommendations were accepted and the people of the State of California founded the Anza-Borrego Desert State Park in 1932. The Park provides important habitat protection for desert plants and animals and its vastness and isolation provides visitors from urban areas a place where they can de-stress their bodies and souls.

Open, unfettered, space is the most important asset of the Anza-Borrego Desert State Park, its vast view sheds remain unmarred by freeways or tall electrical transmission towers - But the visual impact of these proposed wind generators would change this forever!

P99-02

As the inheritors of this park it is our responsibility to ensure that this vast desert landscape remains unchanged, so that future generations will enjoy tomorrow, what we see today.

Sam Webb

Perry, Cedric C

From: Sam & Astrid Webb <swebb@uia.net>
Sent: Wednesday, September 28, 2011 3:37 PM
To: Perry, Cedric C
Subject: OCOTILLO EXPRESS WIND PROJECT PROTEST LETTER
Attachments: ocotillo express protest letter - from sam & astrid webb.doc

Categories: Ocotillo Exp.

Dear Mr. Perry,
Attached is our letter protesting the location of the Ocotillo Express Wind Project.

Sam and Astrid Webb

Sam & Astrid Webb
PO Box 2268
Borrego Springs, CA 92004
Phone: 760/767-0832
E-mail astridwebb@cableusa.com

Sept 28, 2011

Ocotillo Express Wind Energy - Public Comment

Clean renewable energy is good for the environment, but poor site selection is bad!

Energy companies are frantically rushing into building renewable energy projects, often without carefully researching the proper location for these plants.

The proposed location of the Ocotillo Wind Express project around the small desert community of Ocotillo is an example of poor site selection. There are prehistoric Native American cultural features within the project area. This is spiritual land and merely moving a wind generator a few feet away from a feature is not an adequate solution. We are members of the Colorado Desert Archaeology Society, which assists the Colorado Desert District and other nearby agencies in recording, protecting and preserving cultural sites in the Colorado Desert. We had seen many impacts over the years to archaeological sites – this would be the worst ever!

This location also impacts the open view of the desert landscape from many locations in the southern sector of the Anza-Borrego Desert State Park.

It is time to go back to the drawing board to find a better, more environmentally friendly, location for this project.

Sam & Astrid Webb
Borrego Springs, California

Sam & Astrid Webb

PO Box 2268

Borrego Springs, CA 92004

Phone: 760/767-0832

E-mail astridwebb@cableusa.com

Sept 28, 2011

Ocotillo Express Wind Energy - Public Comment

Clean renewable energy is good for the environment, but poor site selection is bad!

Energy companies are frantically rushing into building renewable energy projects, often without carefully researching the proper location for these plants.

P100-01

The proposed location of the Ocotillo Wind Express project around the small desert community of Ocotillo is an example of poor site selection. There are prehistoric Native American cultural features within the project area. This is spiritual land and merely moving a wind generator a few feet away from a feature is not an adequate solution. We are members of the Colorado Desert Archaeology Society, which assists the Colorado Desert District and other nearby agencies in recording, protecting and preserving cultural sites in the Colorado Desert. We had seen many impacts over the years to archaeological sites – this would be the worst ever!

P100-02

This location also impacts the open view of the desert landscape from many locations in the southern sector of the Anza-Borrego Desert State Park.

P100-03

It is time to go back to the drawing board to find a better, more environmentally friendly, location for this project. **P100-03, cont.**

Sam & Astrid Webb

Borrego Springs, California

Comment Letter P101

Perry, Cedric C

From: Carolyn Westelaken <c.westelaken@verizon.net>
Sent: Thursday, September 29, 2011 10:35 AM
To: Perry, Cedric C
Subject: Proposed Ocotillo Wind Energy Facility

Categories: Ocotillo Exp.

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Mr. Perry,

Regarding the proposed Ocotillo Wind Energy Facility:

If this project proceeds, the impacts to natural and cultural resources of Anza-Borrego Desert State Park would be devastating! There will be irreparable damage to the landscape and wildlife. **P101-01**

Furthermore, this project is not needed! Local rooftop and local distributed renewable energy generation could power the 140,000 homes that this project is slated to power. **P101-02**

My family has gone camping in Anza-Borrego for more than 25 years and cannot imagine such a horrific change to this beautiful, pristine desert area. My plea is that you adopt the no-project alternative and protect 12,000 acres of intact desert habitat from destruction for private profit on a project that will be de-commissioned in 30 years! **P101-03**

Sincerely,

Carolyn Westelaken
Manhattan Beach, CA

Perry, Cedric C

From: Robert Wieser <rfw1141@charter.net>
Sent: Wednesday, September 28, 2011 11:48 PM
To: Perry, Cedric C
Subject: Support Ocotillo wind farm

Categories: Ocotillo Exp.

I wish to voice my support for the Ocotillo wind farm.
It is outside the biggest State park in California.
In my opinion the size of the park is adequate to protect various species.

P102-01

Thank you.

Robert F. Wieser
rfw1141@charter.net

Perry, Cedric C

From:	Howard Wilshire <howardgw@comcast.net>
Sent:	Thursday, September 29, 2011 11:45 AM
To:	Perry, Cedric C
Subject:	Ocotillo Express Draft EIS/EIR
Categories:	Ocotillo Exp.

Dear Mr. Perry,

Can you provide a link from which I can download and print figures used in the Ocotillo Express Wind project DEIR/DEIS? **P103-01**

Thank you,

--

Howard G. Wilshire, Ph.D.
Geologist

More on Western U.S. land use, resource depletion, energy issues:
www.theamericanwestatrisk.com

October 3, 2011

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

RE: DEIR/DEIS, Ocotillo Express Wind Energy Project

Following are the comments of Howard Wilshire, Ph.D. (Geology) regarding the subject project. My comments are based on more than 20 years of geological studies of U.S. arid lands while employed by the U.S. Geological Survey. These studies included published reports in refereed journals on the environmental impacts of wind energy developments at Altamont Pass, Tehachapi Pass, and San Gorgonio Pass, California, and many other studies of human impacts on arid lands directly relevant to the project in question. My comments are focused on soil and erosional impacts, drainage disturbance, and consequences (water supply) for offsite vegetation related to Alternative 1.

Section 3 (Soil Resources)
Section 4 (project impacts on soil resources). "Impacts to geology and soil resources were identified based on the predicted interaction between construction, operation, and decommissioning with the environmental setting."

Figure 2_3-3 indicates a dominant turbine alignment, and therefore a dominant access road alignment crossing the drainage system at high angles. Road alignments across and parallel to natural drainages are well-known to capture, divert, and concentrate sheet and rill runoff enhancing erosion. Road diversion of runoff denies downslope vegetation a critical part of its water supply, and over time has been demonstrated to cause significant deterioration of the vegetation community. **P104-01**

Water erosion potential. "Average low precipitation" is irrelevant. What is relevant is frequency and magnitude of high precipitation events of short duration, during which most soil erosion takes place. Soils in and near the project area are mostly well drained and have medium to very rapid runoff. Construction and operation erosion controls are very inadequately discussed. In general culverts, water bars, straw wattles, and road alignments that intercept natural drainages serve to concentrate runoff, increasing its erosive power. They also change the distribution of runoff to which the natural vegetation communities off site were previously adjusted, changing that delicate balance. **P104-02**

Wind erosion potential. Project area is also vulnerable to wind erosion, which is exacerbated by road grading (road building and maintenance). This issue is inadequately discussed. **P104-03**

Soil storage for reclamation: how are stockpiles protected from erosion, how prevented from causing sheet and rill wash diversion and concentration? p. 4.14-2—sheet flow runoff "could increase the potential erosion of unmanaged disturbed and/or stockpiled soil." How, specifically, are soil stockpiles to be managed to eliminate this potential? Soil stockpiles for reclamation are a project lifetime risk of erosion/diversion impacts, not just during construction. **P104-04**

p. 4-14-3 It is claimed that "The Proposed Action's potential to alter the existing drainage pattern(s) of the site would be minimized through compliance with design specifications and BMPs identified by the BLM, listed in Water Resources, Section 4.19.10. Erosion and loss of topsoil would also be **P104-05** minimized through implementation of soil-related BMPs identified by the BLM, listed below in Section 4.14.10. In addition, implementation of the following mitigation measures would be required in order to avoid and/or minimize potential erosion and loss of topsoil: Water-8 (Flood and Erosion Structure Damage Protection), and Water-9 (Construction SWPPP Specifications) (see Section 4.14.10 for the full text of mitigation measures). Mitigation Measure Water-8 would ensure that project structures are designed, engineered, constructed, and maintained to avoid potential damage associated with flooding and/or erosion, and also ensure that the SWPPP would be developed and implemented for the Proposed Action includes specific BMPs to maintain existing surface drainage patterns, thus minimizing potential adverse impacts associated with flooding….. erosion-minimizing efforts such as straw wattles, water bars, covers, silt fences, and sensitive area access restrictions installed before clearing and grading begins and mulching, seeding, or other suitable stabilization measures installed after construction begins would protect exposed areas during construction activities."

This discussion fails to assess the effectiveness of the erosion controls to be applied, or their consequences, such as concentrating sheet flow runoff and therefore its erosive power and causing instead of preventing drainage diversions. The BMPs, being couched entirely in permissive language offer no guarantee of implementation [see comment, p. 4.14-17, below].

P104-05, cont.

p. 4.14-4 "Implementation of Mitigation Measure Soil-1 (Conduct geotechnical studies to assess soil characteristics and aid in appropriate foundation design), presented below in Section 4.14.10, would address impacts related to subsidence. Mitigation Measure Soil-1 requires that design-level geotechnical studies to be performed by the Applicant shall include detailed characterization of sub-surface conditions, including identification of any potentially detrimental chemicals or soil features, as well as proposed solutions regarding how any identified subsurface hazards should be addressed or avoided." These studies have not yet been conducted and cannot represent a "mitigation" as it is not known whether what is discovered can actually be mitigated.

P104-06

p. 4.14-5 The discussion of Operation and Maintenance soil erosion and drainage diversion impacts is entirely unsupported. These activities can indeed accelerate erosion, and the effects of roads/soil stockpiles on channelization, capture, and diversion will last as long as the project lasts, onsite and offsite, and likely longer if decommissioning is governed by non-mandatory BMPs [see comment, p. 4.14-17, below].

P104-07

p. 4.14-6 The statement that "Operation and maintenance of the proposed OWEF would not result in any impacts to soil resources." is both ludicrous and unsupported.

P104-08

p. 4.14-17. BLM Best Management Practices (BMPs) are all cast in permissive language ("should") rather than mandatory language ("shall"). Therefore a rigorous monitoring program, consisting of the following elements is necessary to assure compliance:

1) A description of the assets to be monitored and their post-construction pre-operation condition;
2) Specific intervals for evaluating conditions; supplementary evaluations following storms;
3) Thresholds giving changed conditions that require action; and
4) Specific actions to be taken at any threshold of change.

P104-09

p. 4.14-18. Project-specific mitigations, in addition to BLM BMPs include Soil-1, which consists of studies not yet performed. This cannot be considered a mitigation under CEQA. **P104-10**

Section 4.19, Water Resources (project effects on water resources)

p. 4.19-14. The supposition that "Operation and maintenance would not substantially alter existing drainage patterns or result in substantial erosion, siltation, or flooding on or off site" ignores the abundant evidence of significant drainage alterations that result from road-building on low alluvial slopes. These are very well documented in the Mojave Desert and elsewhere, but appear unknown to the preparers of this DEIR/DEIS (see Howard Wilshire, Jane Nielson, and Richard Hazlett, *The American West at Risk: Science, Myths, and Politics of Land Abuse and Recovery*, Oxford University Press, 2008, Chapter 5, and references cited). **P104-11**

p. 4.19-16. Water requirements for decommissioning are grossly understated. To assure viable native plant restoration of disturbed areas, with assured species diversity and density, will require water resources over a long period of time, probably well over a decade.

Expecting the operators to gain a "clear understanding of the local hydrogeology" is unrealistic as are expectations of their actions, such as avoiding "creating conduits between two aquifers." Hydrogeology is a complex subject, which is why it is a separate discipline in geology. **P104-12**

p. 4.19-55. Mitigation measures. The BLM Best Management Practices have the same deficiencies as stated above in application to soil resources: they are all stated in permissive language, so the public does not have a guarantee that they will in fact be implemented. **P104-13**

Climate change discussion in the above sections is elementary and non-site specific; focus is entirely on GHG releases, with one mention of desert plant CO_2 uptake; no consideration is given to potential impacts on water supplies from changed precipitation patterns, or on site surface stability from increasing storm violence and frequency; no appreciation at all that sudden climate change is entirely within the realm of the possible within the life-expectancy of this project. The preparers badly need to educate themselves on scientific products of the BLM's sister agencies, in particular USGS, as well as the open scientific literature on climate change. **P104-14**

I believe the rush to approval of this and similar projects has led to canned impact assessments based on very few information resources. There is an abundance of scientific literature on arid lands processes directly relevant to this project, which the preparers, perhaps for lack of time and diligence, have failed to use in their assessments. I recommend that you go back to the drawing board and give the public a thorough competent analysis, mitigations that are truly likely to be implemented or the project terminated, and a firm monetary guarantee that the public will not be stuck with yet another ill-conceived mess on their lands when the owners depart. **P104-15**

Sincerely,

Howard Wilshire
3727 Burnside Rd.
Sebastopol, CA 95472

Perry, Cedric C

From:	Don Wood <dwood8@cox.net>
Sent:	Wednesday, September 28, 2011 4:21 PM
To:	Perry, Cedric C
Subject:	Pacific Energy Policy Center Comments on the proposed Ocotillo Wind Energy Facility
Attachments:	Doc1.doc
Categories:	Ocotillo Exp.

Pacific Energy Policy Center

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov <mailto:cperry@blm.gov>

Subject: Comments on the proposed Ocotillo Wind Energy Facility

We are writing to ask that you oppose the construction of the proposed Ocotillo Wind Energy Facility. This project is unnecessary and should be rejected for a wide variety of reasons, some of which are listed below.

Potential Negative Impacts on Anza-Borrego Desert State Park (ABDSP)

1. Disruption of wildlife corridors for desert bighorn sheep.

2. Adverse effects to golden eagles due to the birds striking the turbines.

3. Adverse impacts to burrowing owls, long-eared owls, Vaux's swift, peregrine falcons, flat-tailed horned lizards, barefoot geckos, Red diamond rattlesnakes, American badgers, and several listed plant species.

4. Significant increase in the deaths of bats due to the drop in air pressure causing internal hemorrhaging in the lungs as well as deaths from direct strikes.

5. Unavoidable impact to plants during construction and the introduction of invasive plant species.

6. Permanent scarring to the landscape leaving an "industrial" look to the area.

7. Visual impacts to the newly designated Cultural Preserve at Piedras Grandes, just west of Ocotillo and its "sacred site."

8. No adequate accounting for impacts to the multiple cultural resources of

the area when viewed as a cultural landscape.

9. Cultural impact studies not completed prior to assessing impacts.

10. Substantial increase in noise levels from the operation of the turbines, especially at night in surrounding areas.

11. Impacts to air quality from truck traffic and from concrete batch plants.

12. Increased risk of wildfire hazards.

13. Loss of soil's ability to absorb carbon from scraping

14. Degradation to the recreational and natural experience of ABDSP by the sight of the turbines and associated facilities

15. Loss of dark night skies.

16. Degradation of wilderness character of the several BLM wildernesses surrounding the proposed project.

The NEPA Document does not include or assess the reduced impacts of an alternative based on production of rooftop solar renewable energy at point of use in cities and thus the Draft EIR/EIS is incomplete.

We urge you to adopt the "no project" alternative and protect this critical desert habitat from devastation.

Don Wood, Senior Policy Advisor
Pacific Energy Policy Center
4539 Lee Avenue
La Mesa, CA 91941
619-463-9035
dwood8@cox.net

Pacific Energy Policy Center

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov

Subject: Comments on the proposed Ocotillo Wind Energy Facility

We are writing to ask that you oppose the construction of the proposed Ocotillo Wind Energy Facility. This project is unnecessary and should be rejected for a wide variety of reasons, some of which are listed below. **P105-01**

Potential Negative Impacts on Anza-Borrego Desert State Park (ABDSP)

1. Disruption of wildlife corridors for desert bighorn sheep. **P105-02**
2. Adverse effects to golden eagles due to the birds striking the turbines.
3. Adverse impacts to burrowing owls, long-eared owls, Vaux's swift, peregrine falcons, flat-tailed horned lizards, barefoot geckos, Red diamond rattlesnakes, American badgers, and several listed plant species.
4. Significant increase in the deaths of bats due to the drop in air pressure causing internal hemorrhaging in the lungs as well as deaths from direct strikes.
5. Unavoidable impact to plants during construction and the introduction of invasive plant species.
6. Permanent scarring to the landscape leaving an "industrial" look to the area.
7. Visual impacts to the newly designated Cultural Preserve at Piedras Grandes, just west of Ocotillo and its "sacred site." **P105-03**
8. No adequate accounting for impacts to the multiple cultural resources of the area when viewed as a cultural landscape.
9. Cultural impact studies not completed prior to assessing impacts.
10. Substantial increase in noise levels from the operation of the turbines, especially at night in surrounding areas. **P105-04**

11. Impacts to air quality from truck traffic and from concrete batch plants.
12. Increased risk of wildfire hazards.
13. Loss of soil's ability to absorb carbon from scraping
14. Degradation to the recreational and natural experience of ABDSP by the sight of the turbines and associated facilities
15. Loss of dark night skies.
16. Degradation of wilderness character of the several BLM wildernesses surrounding the proposed project.

P105-04, cont.

The NEPA Document does not include or assess the reduced impacts of an alternative based on production of rooftop solar renewable energy at point of use in cities and thus the Draft EIR/EIS is incomplete.

We urge you to adopt the "no project" alternative and protect this critical desert habitat from devastation.

P105-05

Don Wood, Senior Policy Advisor
Pacific Energy Policy Center
4539 Lee Avenue
La Mesa, CA 91941
619-463-9035
dwood8@cox.net

Perry, Cedric C

From:	david@davidworthy.com
Sent:	Thursday, September 29, 2011 9:56 AM
To:	Perry, Cedric C
Subject:	Ocotillo-Borrego Springs
Categories:	Ocotillo Exp.

I own the 3 Martini Ranch in Borrego Springs California ...
I *approve* the idea of the wind turbines ...
David Worthy

P106-01

Perry, Cedric C

From:	Sandra Zelasko <slzphoto@sbcglobal.net>
Sent:	Wednesday, September 28, 2011 10:42 PM
To:	Perry, Cedric C
Subject:	Opposition to the Ocotillo Wind Energy Facility project.
Categories:	Ocotillo Exp.

Dear Mr. Perry,

I adamantly oppose the proposed Ocotillo Wind Energy Facility project. Please do not go forth with this! Among other things, this would be a huge disruption of wildlife corridors for desert bighorn sheep. There is no end to the consequences of this project including the unsightly visual impact and the noise it will create. **P107-01**

Sincerely,

Sandy Zelasko
Sandra Lee Photography
"Education through photography. Discovering nature one image at a time."
15864 Severino Lane
Valley Center, CA 92082
760-749-2174
www.SandraLeePhotography.com
www.printroom.com/pro/sandraleephotography
www.photosourcebook.com/2121

Perry, Cedric C

From: anne seeman <sguanne@yahoo.com>
Sent: Monday, October 03, 2011 6:07 PM
To: Perry, Cedric C
Cc: angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; terryweiner@sbcglobal.net
Subject: Ocotillo Express Wind Project

Dear Mr. Perry,

I live far from the Ocotillo/Yuha area, but I value the wild deserts of southern California, where my brother lived. He died a year ago, but he loved the deserts, and our family treasures the times we spent exploring them with him. To honor his memory, I am speaking up to protect the Ocotillo/Yuha area. **P108-01**

While I support development of energy alternatives to oil and coal, the Ocotillo Express Wind Project is ill-conceived. It would have negative impacts on wildlife such as the Peninsular bighorn sheep, the flat tailed horned lizard, golden eagles and other birds, and many species of bats. It would desecrate several ancient Native American cultural sites in the Yuha desert. It is too close to the protected Anza-Borrega Desert State Park. **P108-02**

I would prefer to see wind and solar power generated on site in cities such as my own, San Francisco. We have rooftops for solar panels, and I have seen buildings designed with built-in wind turbines. In fact, my neighborhood is so windy, it was once called the Valley of the Windmills. Large swaths of wilderness are best left that way, for there we have the opportunity to discover the natural world on a scale that fills us with awe, and hopefully inspires us to preserve it for future generations. **P108-03**

Please do not approve the Ocotillo Express Wind Project. **P108-04**

Sincerely,
Anne Seeman
523 Campbell Ave.
San Francisco, CA 94134

Perry, Cedric C

From: Bob McCulley <crazyhorse289@gmail.com>
Sent: Tuesday, October 04, 2011 5:26 AM
To: Perry, Cedric C
Subject: Anza-Borrego wind developement project

Good morning, my name is Bob Mcculley. I live in Miami , Fl. I have traveled to the Anza-Borrego, (and the Salton Sea) areas numerous times. I photograph and study the desert landscape and enviroment. I am a landscaper and I am very interested in designing gardens that are visually exciting as well as smart water users. Having seen development destroy the Everglades, I know first hand how any alteration of the natural enviroment can be destructive. So now, after years of destroying the Everglades, attempts are now being made to restore that natural set of conditions that can hopefully restore the Everglades -- unfortunately the reality is that the Everglades can never be fully restored, whether it be the natural water flow or the natural wildlife travel corridors. Barriers will still be everywhere through-out the Everglades and the joy and awe of experiencing the Everglades will,(and is) gone forever. Please do not let this happen to the Anza-Borrego. This unique and beautiful area deserves better. Whether you hike through-out the Anza or simply drive through, the experience is un-forgettable and magical. Stop the development in Anza-Borrego now and avoid the hindsight of "WHAT HAVE WE DONE?" Sincerely, Bob Mcculley. **P109-01**

Perry, Cedric C

From: Bonnie Nickel <bjnickel@hotmail.com>
Sent: Tuesday, October 04, 2011 11:18 AM
To: Perry, Cedric C
Subject: Ocotillo Wind Farm

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Mr. Perry,

It has come to my attention that there is a wind farm proposed for the acreage near Ocotillo, CA, near Anza-Borrego Desert State Park. For the past two decades, we and our friends have made a trek twice a year to camp nearby, at Indian Valley, in ABDSP. While the view from there will not be compromised by the wind farm, I realize that other areas of the Park will be impacted.

One of the main reasons we enjoy our camping experience out there is that we feel like we are away from all civilization. I think this is a unique desert experience, and I would hate to see it permanently altered. Is there no other location, further away, on BLM land, out of view of the Park? Please reconsider this project.

P110-01

Sincerely,

Bonnie Nickel

Perry, Cedric C

From:	brian silvey <besilvey@hotmail.com>
Sent:	Monday, October 03, 2011 7:22 PM
To:	Perry, Cedric C; brian silvey
Subject:	Ocotillo Express Wind Project
Attachments:	Ocotillo Wind Farm.pdf

Dear Mr. Perry,

Growing up in Southern California I regularly enjoyed the Anza Borrego Desert State Park. About 30 year ago I moved away from California but have always managed to get back to spend time in the beautiful desert park. Recently I was able to realize a dream and buy a second home in Borrego Springs. I am in the renewable energy business and have witnessed firsthand the unintended consequences of well meaning but misguided projects. Sometimes the projects are not even well intended, but simply created for the profit potential. The effects of this particular project will be widespread and detrimental to the area. I have attached my letter of opposition. Thanks for your consideration. **P111-01**

Regards,
Brian Silvey

September 29, 2011

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Mr. Perry:

I am writing you to voice my opposition to the Ocotillo Wind Energy Facility proposed adjacent to the Anza-Borrego Desert State Park. **P111-02**

This project is not needed. Local rooftop and local distributed renewable energy generation could power the 140,000 homes that this project is slated to power. Adopt the no-project alternative and protect 12,000 acres of intact desert habitat from destruction for private profit on a project that will be de-commissioned in 30 years. If this project goes through, there will be irreparable damage to the landscape. **P111-03**

The impact of wind farms to the environment is considerable, the energy generated is not economically feasible and without scarce taxpayer funds provided to projects, they would never be developed. I fully support the efforts to find alternative sources of energy, but wind turbines in their current form should not be one of them. **P111-04**

Please do not allow this project to go forward. Thank you.

Sincerely,

Brian Silvey

Brian Silvey

P.O. Box 422

Borrego Spring, CA 92004

Perry, Cedric C

From: Chad Bird <acbirdman@yahoo.com>
Sent: Monday, October 03, 2011 10:03 PM
To: Perry, Cedric C
Subject: Opposition to the Ocotillo Express Wind Project

Dear Mr. Perry,

P112-01

I would like to express my opposition to the Ocotillo Express Wind Project. I have visited this area and the nearby Anza-Borrego State Park quite frequently and cannot imagine that this magnificent desert area would be subjected to such use, with the resulting irreparable damage that would result. In addition to the 'eyesore' that it would become, I understand that it would:

- Devastate vital habitat for the Endangered Peninsular bighorn sheep, and the flat-tailed horned lizard — a perennial candidate for listing under the Endangered Species Act.
- Add significantly to the cumulative impact on the above species from other energy and agricultural projects in the area.
- Pose a serious threat of injury and death to golden eagles and other raptors known to live in the area, as well as the LeConte's thrasher, burrowing owls, several other sensitive bird species, and as many as twelve species of bats.
- Forever alter the wild character of the southern parts of Anza-Borrego Desert State Park, destroying its recreational qualities.
- Desecrate ancient Native cultural sites in the Yuha Desert cultural area, and interfere with the work of the soon-to-be-opened Imperial County Desert Museum.
- Turn the town of Ocotillo from a quiet, bucolic desert refuge to an industrial zone full of deafening noise 24 hours a day.
- Illegally alter the landscape surrounding the protected Juan Bautista de Anza National Historic Trail.
- Devastate those parts of Imperial County's economy that depend on tourism in the unspoiled desert.

P112-02

Please consider the "No Project Alternative" for this project! Please do not allow this area to become a wind energy resource. Please consider and acknowledge the current resourceful value that this beautiful area offers as it is.

Sincerely,

Chad Bird
2355 Summercreek Way
Escondido, CA 29029

Perry, Cedric C

From: Charlie Aron <charliearon12@gmail.com>
Sent: Tuesday, October 04, 2011 11:49 AM
To: Perry, Cedric C; angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Cc: conrad@theabf.org
Subject: The Ocotillo Express Wind Project

My husband and I bought a home in Borrego Springs and moved here permanently last month. We have been visiting Anza Borrego Desert State Park every winter for the past ten years. We recognize Anza Borrego Desert State Park and the community of Borrego Springs as unique. We moved here because we were confident that this unique character would be preserved and protected in perpetuity. We are alarmed and disappointed to learn of the Ocotillo Express Wind Project. We believe the hasty approval of this project will result in devastating vital habitat. It will add significantly to the cumulative negative impact from other energy and agricultural projects in the area. A hasty decision without fully analyzing the impact will forever alter the wild character of the southern parts of Anza Borrego Desert State Park. **P113-01**

Please consider this public comment, and all others you receive, rather than shortchanging the advice of those the project will negatively impact. Please adopt the no project alternative. Please extend the public comment period by at least 30 days. Please hold additional public scoping meetings at which public statements will be allowed/encouraged. Find a way to use wind technology in the desert without permanently impacting a unique treasure. Thank you for considering all opinions. **P113-02**

Sincerely,

Charlene Aron
Borrego Springs resident

Perry, Cedric C

From: Charles & Laurie Baker <two.bakers.r.us@gmail.com>
Sent: Monday, September 19, 2011 6:44 PM
To: Terirami@blm.gov; Perry, Cedric C
Subject: OCOTILLO EXPRESS WIND FACILITY

OCOTILLO EXPRESS WIND FACILITY

To Whom It May Concern:

The Bureau of Land Management recently denied the public comment opportunities at the El Centro and Ocotillo meetings for the proposed 12,000-acre Ocotillo Wind Express Energy Project on August 24th and 25th, 2011.

Public comments are an important process in the review of large projects like this. Many people would prefer to submit their comments at a meeting rather than in writing. The BLM need only provide a court reporter to record oral comments. When people travel great distances and are not permitted to speak, it appears as though the BLM has already decided to approve this project. This wind project will have negative impacts on native plants and wildlife, prehistoric cultural sites, Native American values, visual resources, private property, property values, and access to public lands. It is the responsibility of the BLM to hear all concerns associated with this project. The BLM can best accomplish this by accepting all comments in both written and oral form.

P114-01

The BLM's National Environmental Policy Act Handbook states: "Public involvement begins early in the NEPA process, with scoping, and continues throughout the preparation of the analysis and decision." Agencies are required to "make diligent efforts to involve the public in preparing and implementing their NEPA procedures" (40 CFR 1506.6(a).

We would like to request that the BLM hold another series of public meetings in the local communities in which oral public comments are accepted and recorded. We would also like to request a 30-day extension on the comment deadline for the Draft Environmental Impact Statement. This would allow more time for the public to prepare for additional meetings.

Sincerely,

Charles and Laurie Baker
10217 Strathmore Dr.
Santee, CA 92071

Perry, Cedric C

From: Chip Leavitt <chip.leavitt@verizon.net>
Sent: Monday, October 03, 2011 7:30 PM
To: Perry, Cedric C
Cc: angelinahavens@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; johnrenison@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Subject: STOP The Ocotillo Express Wind Project!!!!

Importance: High

STOP THE OCOTILLO EXPRESS WIND PROJET!

THIS PROJECT WOULD BE DEVASTATING TO THE DESERT LANDS IT PROPOSES TO OCCUPY:

IT WOULD:

P115-01

- DESTROY vital habitat for the Endangered Peninsular bighorn sheep, and the flat-tailed horned lizard — a perennial candidate for listing under the Endangered Species Act.
- Add significantly to the cumulative impact on the above species from other energy and agricultural projects in the area.
- Pose a serious threat of injury and death to golden eagles and other raptors known to live in the area, as well as the LeConte's thrasher, burrowing owls, several other sensitive birds species, and as many as twelve species of bats.
- Forever alter the wild character of the southern parts of Anza-Borrego Desert State Park, destroying its recreational qualities.
- Desecrate ancient Native cultural sites in the the Yuha Desert cultural area, and interfere with the work of the soon-to-be-opened Imperial County Desert Museum.
- Turn the town of Ocotillo from a quiet, bucolic desert refuge to an industrial zone full of deafening noise 24 hours a day.
- Illegally alter the landscape surrounding the protected Juan Bautista de Anza National Historic Trail.
- Devastate those parts of Imperial County's economy that depend on tourism in the unspoiled desert

Sincerely,

Charles & Lara Leavitt

Charles Leavitt
826 East Palm Avenue
Monrovia, CA
91016-3021

Comment Letter P115

chip.leavitt@verizon.net

Perry, Cedric C

From: cheryl griffin <cherylgriffincosmo@gmail.com>
Sent: Monday, October 03, 2011 6:41 PM
To: Perry, Cedric C
Subject: Anaz Borrego State Park

Ocotillo Express Wind Project should reconsider the location in which they have chosen to construct their energy facility. The chosen site will pose a threat to endangering Peninsula bighorn sheep and flat tailed lizards.

Also poses a threat to injury and death to the golden eagles, several bird species, burrowing owls, and twelve species of bats. Once these inhabitants are destroyed from our Earth, they are gone forever.

The Ocotillo Express Wind Project will desecration ancient Native cultural sites in the Yuha Desert cultural area and interfere with the work of the soon-to-be-opened Imperial County Desert Museum.

Please, again reconsider placing the Ocotillo Express Wind Project near Anza Borrego State Park.

P116-01

Concerned,
Cheryl Griffin

Comment Letter P117

Perry, Cedric C

From: christa vragel <bcvrag@gmail.com>
Sent: Monday, October 03, 2011 6:12 PM
To: Perry, Cedric C
Cc: angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; raycastillo@co.imperial.ca.us; terryweiner@sbcglobal.net
Subject: The Ocotillo Express Wind Project

"Don't Build Ocotillo Wind"

The project would:

- *Devastate vital habitat for the Endangered Peninsular bighorn sheep, and the flat-tailed horned lizard — a perennial candidate for listing under the Endangered Species Act.*
- *Add significantly to the cumulative impact on the above species from other energy and agricultural projects in the area.*
- *Pose a serious threat of injury and death to golden eagles and other raptors known to live in the area, as well as the LeConte's thrasher, burrowing owls, several other sensitive birds species, and as many as twelve species of bats.*
- *Forever alter the wild character of the southern parts of Anza-Borrego Desert State Park, destroying its recreational qualities.*
- *Desecrate ancient Native cultural sites in the the Yuha Desert cultural area, and interfere with the work of the soon-to-be-opened Imperial County Desert Museum.*
- *Turn the town of Ocotillo from a quiet, bucolic desert refuge to an industrial zone full of deafening noise 24 hours a day.*
- *Illegally alter the landscape surrounding the protected Juan Bautista de Anza National Historic Trail.*
- *Devastate those parts of Imperial County's economy that depend on tourism in the unspoiled desert*

P117-01

The Draft EIR/EIS is deficient because:

- *It does not include a "Distributed Generation" alternative*
- *Public comment was shortchanged due to a truncated "scoping" process*

P117-02

- *Adopt the "no project" alternative*
- *Extend the public comment period by at least 30 days*
- *Hold additional public scoping meetings at which public statements would be allowed.*

P117-03

Sincerely,

Christa Vragel
NewSchool of Architectutre and Design

Perry, Cedric C

From:	Cindy Walsh <ckwalsh@ucsd.edu>
Sent:	Tuesday, October 04, 2011 12:58 PM
To:	Perry, Cedric C
Subject:	Proposed Ocotillo Wind Energy Facility

Mr. Perry,

If this project goes through, there will be irreparable damage to the landscape and adverse impacts on desert wildlife. **P118-01**

This project is not needed. Local rooftop and local distributed renewable energy generation could power the 140,000 homes that this project is slated to power. **P118-02**

Cindy Walsh

ckwalsh@ucsd.edu

Peace is not merely a distant goal that we seek, but a means by which we arrive at that goal.
~MLK Jr.

Perry, Cedric C

From: C Kunishige <darlaxox8@gmail.com>
Sent: Monday, October 03, 2011 5:39 PM
To: Perry, Cedric C
Cc: angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Subject: Ocotillo Wind Project

Dear Mr. Perry,

We have been visiting the Anza Borrego State Park for over thirty years now, and have explored the many miles outside of the park. The beauty of this wild place is not like any other place in the world and, although we support every effort of our country to make the move into alternative energy, putting a wind project near Ocotillo is a sacrifice too great for the amount of energy return. **P119-01**

We believe that more studies should be done, especially because of the economic situation. Lets make sure that from now on any alternative energy projects have the ability to deliver what they promise, and not at the expense of such unparalleled beauty, that would be ruined for as long as those turbines stand. **P119-02**

We ask that the project be abandoned or, at the very least, for a 30 day extension of the public comment period. **P119-03**

Edward Abbey said, "The idea of wilderness needs no defense, it only needs defenders." Please be a defender of the Anza Borrego and Ocotillo lands.

Sincerely,

Vincent Loverde
Cynthia Kunishige

9-28-11

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11 SEP 30 PM 4:11
CALIF. DESERT DISTRICT
MORENO

Mr. Perry-

I am hand-writing this letter to please reconsider the Ocotillo Wind Energy Facility proposal.

This unusual and beautiful landscape has been admired and enjoyed by my family, my friends and myself our whole lives and the wind turbines would irreparably ruin it.

California's desert needs your protection from this catastrophe.

Again, please, consider the alternatives to this project and save our precious habitat.

P120-01

With much appreciation in advance,
Erica Daniel

Comment Letter P121

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CALIF. DESERT DISTRICT
MORENO VALLEY, CA

439 Chateau La Salle Dr.
San Jose, CA
95111

Sept. 30, 2011

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Mr. Perry,

We visited Anza Borrego Desert State Park for the first time in April this past year. It was our first camping trip to this park. We had wanted to visit the park for years, as we had heard about its beauty in the spring. We went finally for Steve's birthday (April 3, 2011) – and Anza Borrego Desert State Park did not disappoint.

We would return. Everyone should have the chance to visit this beautiful park in the spring! The largest state park in the region, if not the country.

P121-01

We are long time members of Santa Clara Valley Audubon Society (SCVAS) in Cupertino, California. This past summer, our Audubon was faced with the same dilemma that the Anza Borrego Foundation is faced with – namely **the proposed Ocotillo Wind Energy Facility.**

Our Audubon filed a lawsuit againt a simlar renewable energy prospect - a proposed solar farm in the Panoche Valley of nearby San Benito County that would cover this valley, one of Audubon's Important Bird Areas (IBAs).

P121-02

The proposed wind farm outside of Anza Borrego Desert State Park is likewise in a location that is not compatible with this desert state park. Such a magnificent park. Such an intrusive wind farm.

Isn't there a better place to put the proposed wind farm than alongside Anza Borrego Desert State Park? Please re-site this wind farm elsewhere.

P121-03

We are writing at the bequest of the Anza Borrego Foundation.

Thank you for your interest.

Sincerely,

Carolyn Straub

Steve McHenry

30 Sep 201
Borrego Spr. C

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CALIF. DESERT DISTRICT
MORENO VALLEY, CA

Greetings

The purpose of this letter is to express
my concern that the Ocotillo Wind Ene
Facility in the SW corner of Imperial
County, CA will severely damage the
tourism/recreation industry in adjoining
areas. The viewshed will be utterly destr
along the main entrance corridor (I-8)
the San Diego "package" of tourist offe
The south entrance to Anza-Borrego De.
State Park, and associated private busin
will lose the compellingly beautiful
spaciousness that I have known and lo
for 50+ years. It will become "dri
by" country.

P122-01

The timeline for decision making about t
project needs to be extended into the wi
months so winter visitors/residents, who
quadruple our population, can be madi
aware. Have San Diego area recreationi

P122-02

been made aware of this impending los. Even though the entire physical plant would be in Imperial County, it is San Diego County that would bear th loss. **P122-02, cont.**

Finally, why put a wind farm in an ar that is notoriously windless? **P122-03**

Sincerely
Arnold Mroz
P.O. Box 1461
Borrego Spr. CA
92004
(760) 767-3325

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11 OCT -3 PM 4:16

CALIF. DESERT DISTRICT
MORENO VALLEY, CA

Barbara J. & Peter A. Halle'
286 Holiday Way
Oceanside, CA 92057-5142
(760) 433-1978

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan de Los Lagos
Moreno Valley, CA 92553

September 30, 2011

Mr. Perry:

We are writing to post our objections to the construction of the proposed Ocotillo Wind Energy Facility.

You have heard all of the arguments so we will not waste your time by listing them all. The only question we would raise, is "why?"

When other options are available for the production of the proposed amount of produced energy, "why" would the BLM even consider such a project that would negatively impact in so many areas? **P123-01**

As the Environmental Impact Study for this project does not meet Environmental Protection Agency requirements, it is hard to understand "why" the project is moving forward.

Please reconsider how such a project would negatively impact the Anza-Borrego and Borrego Springs area, and reject it. Why would anyone want to impinge on one of three designated "dark sky" areas in the world?

Thank you.

Barbara J. Halle
Peter A. Halle'

Barbara J. Halle
Peter A. Halle

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11 OCT -3 PM 4:17

CALIF. DESERT DISTRICT
MORENO VALLEY, CA

Janene Colby
Wildlife Biologist
P.O. Box 1814
Borrego Springs, CA 92004

September 29, 2011

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

RE: Public Comments Concerning the Ocotillo Express Wind Turbine Project

Dear Mr. Perry and the Bureau of Land Management:

The Mission Statement of the BLM is to sustain the health, diversity and productivity of the public lands for the use and enjoyment of future generations. It does not state that the BLM should turn over our public lands for the use and profit of private industry. **P124-01**

What will the public gain if the BLM allows this wind turbine project to be built? It will NOT give the public cheap, reasonable or reliable electricity. It will further our reliance on large corporations to provide for us. It will destroy desert view sheds, solitude and recreational opportunities for us and future generations. It will destroy habitat for wildlife and endangered species. It will result in a loss of wildlife corridors and movement. It will kill migratory birds and bats. These are just a few of the numerous negative impacts the public has expressed concerning this project. **P124-02**

But *we* the public should not worry that this project will destroy our public lands and habitat for wildlife because it will be *mitigated.* Land will be purchased elsewhere... it doesn't matter if the land is not suitable habitat for the species of concern. Artificial water sources will be installed for wildlife.....even though the habitat in which they are installed is not suitable to support other requirements such as an adequate and reliable source of food. And, how does one mitigate the loss of migratory birds and in particular golden eagles? Employing a single person to monitor for threats to birds across the entire project is ludicrous at best. **P124-03**

The draft EIR/EIS does not address an alternative for production of renewable energy at point of use such as roof top solar. Therefore, I implore the BLM to adopt the "no project" alternative. Please restore the public's faith in our federal agencies to administer and manage public lands for all Americans and not for just a few for profit groups. **P124-04**

Sincerely,

Janene Colby

Comment Letter P125

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11 OCT -3 PM 4:17

CALIF. DESERT DISTRICT
MORENO VALLEY, CA

September 30, 2011

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Mr. Perry,

P125-01

I am writing to you today in regards to the proposed Ocotillo Wind Energy Facility.

We are very much against it!

We live in Borrego Springs the town that is surrounded by the Anza-Borrego State Park. We fell in love with the desert many years ago and that is why we decided to live here permantly.

We have been to all of the various sights in this magnificent desert. Places like Coyote Canyon, Ocotillo Wells, Vallecito, Mason Valley, Hawk Canyon, Culp Valley, Font's Point, Blair Valley, Palm Canyon, Desert Cahuilla, Borrego Badlands and Elephant Tree Trail just to name a few. We have viewed many Hawks, Owls, Bighorn Sheep, Foxes, Jack Rabbits, Antelope squirrels and we can't forget the reptiles. We can't imagine the disruption in wildlife, scarring of the landscape and Native American 'sacred sites' that this project would cause. Once it is gone it will be gone forever.

There are many dedicated land owners, volunteers and rangers, that have worked hard through the years to keep this place serene. To see the viewshed ruined by this wind energy facility is just as bad as putting in the Sunrise Powerlink.

We firmly believe that this project is not the answer. More research needs to take place on discovering alternative energy means. Lets protect our environment and not destroy it.

Sincerely,

Alex and Nancy Boss Alex Boss Nancy Boss

Comment Letter P126

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BUREAU OF LAND MGMT.

11 OCT -3 PM 4:19

CALIF. DESERT DISTRICT
MORENO VALLEY, CA

October 30, 2011

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, Ca 9223

Dear Mr. Perry,

I am absolutely opposed to the proposed Ocotillo Wind Energy Facility near Ocotillo. While I support goals to reduce our dependence on foreign oil, this project will set back those efforts by causing the non-essential destruction of natural resources and environmental beauty. The energy generated by this project will be dramatically outweighed by the damage to the environment, the degradation of the beauty of Anza-Borrego Desert State Park, and the outrage of all those who live in and enjoy the area.

I am a frequent visitor to the desert, an escapee from the asphalt landscape most of us must endure because of our historic in-attention to our environment. I am a volunteer at the Anza-Borrego Desert State Park, contributing hundreds of hours to the protection of the environment, our heritage, and our history. If you approve the implementation of the Ocotillo Wind Energy Facility you will be offsetting those efforts, stealing my right to enjoy an important national resource, and setting back the alternative energy movement,

P126-01

Sincerely,

Norm Gallagher
La Mesa, California

Comment Letter P127

RECEIVED
BUREAU OF LAND MGMT.
11 OCT -3 PM 4:19
CALIF. DESERT DISTRICT
MORENO VALLEY, CA

10515 Livewood Way
San Diego, CA 92131

September 30, 2011

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

RE: PROPOSED OCOTILLO WIND ENERGY FACILITY

Dear Mr. Perry:

P127-01 I am writing as a member of the Anza-Borrego Foundation (the "ABF"), which has a membership of 1,800 households. I am concerned about the proposed Ocotillo Wind Energy Facility that is sited directly adjacent to Anza-Borrego Desert State Park (the "Park"). The ABF is a nonprofit public benefit corporation with a mission to support the Park. While the ABF supports the development of renewable energy sources, such as wind and solar, we advocate for distributed generation, the concept that this energy should be generated closer to the population centers that will consume it.

P127-02 This 12,000-acre development would mar the viewshed of the Park from many overlooks that are popular with hikers in the Park. In addition, the famed experience of the desert, the silence, the darkness, and wide vistas would be forever changed in lands that directly border wilderness designated areas.

P127-03 The project would also have devastating impacts to biological resources. The highly endangered Peninsular Big Horn sheep now live in and migrate through the project area. The impact of the project on the sheep would be extremely negative. Other desert animals would also be negatively impacted.

We are also concerned that the draft EIS does not meet NEPA requirements. It does not appear to consider a full range of alternatives, including distributed generation. There is also not a "no-project" alternative. This must be an option if impacts are considered to be too disastrous.

ABF is opposed to this project, in any form, being located adjacent to the Park. We request that you do not approve this project. **P127-05**

Sincerely,

Will A Reavey

William A. Reavey

RECEIVED
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11 OCT -3 PM 4:20
CALIF. DESERT DISTRICT
MORENO VALLEY, CA

30 September 2011

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan de los Lagos
Moreno Valley, CA 92553

Re: Ocotillo Express Wind Turbine Project

Dear Mr. Perry,

P128-01

I write on behalf of my family. Our roots in this region date from the time our great grandparents crossed the dunes west of Yuma on the old plank road. Ever since, the natural and cultural resources in the desert areas of San Diego and Riverside counties have had a wonderfully positive impact on the education and life experiences of their, and our, children.

The integrity of those resources is now threatened by an ill-considered and unconscionably sited wind farm project. The proposed Ocotillo Project will damage much – especially in the priceless Anza-Borrego Desert State Park area – while it offers nothing that cannot be had under favorable terms elsewhere. Such a trade-off is a poor policy choice and a horrible legacy. We can do better.

Please adopt the "No Project" alternative available to you.

This invaluable desert habitat is too important, to too many people, to be devastated by an error such as the one proposed for Ocotillo.

Sincerely,

Dr. Anthony D. Mc Ivor
8080 Cinnabar Dr.
La Mesa, CA 91941

Comment Letter P129

September 30, 2011

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Fax to: State Clearinghouse: 916-323-3018

Re: Ocotillo Wind Energy Facility

Dear Mr. Perry

We wish to register our objection to the Ocotillo Wind Energy Facililty to be located adjacent to Anza Borrego Desert State Park (ABDSP). For years we have hiked and camped in ABDSP and enjoy the peace, solitude, natural landscape, amazing night skys, quite and clean air found there. To corrupt this magnificant area with a wind farm would be unforgiveable.

Not only would the visual landscape be corrupted by the proposed wind farm, but so too would the land and landscape that many animals, reptiles, and insects call home. Likewise the variety of the flora of the area would be compromised.

P129-01

We urge that the BLM not approve the degradation of a one of a kind area in our state. Untill every roof in every city has solar panels installed no desert habitat should be destroyed. It is immensely more sensible to produce solar and wind engery in the area where it will be used, rather than stringing miles of transmission lines.

Please do not allow our desert areas to be destroyed.

P129-02

Sincerely,

Ellen LaMotte

Jim and Ellen LaMotte

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11 OCT -3 PM 4:24
CALIF. DESERT DISTRICT
MORENO VALLEY, CA

Cc:

Chuck Bennett, President
Ralph Singer, Vice-President Environmental Affairs
Diana Lindsay, Trustee
ANZA-BORREGO FOUNDATION
P.O. Box 2001
Borrego Springs, CA 92004

Comment Letter P130

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11 OCT -3 PM 4:24

CALIF. DESERT DISTRICT
MORENO VALLEY, CA

September 29, 2001

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Mr. Perry,

Impacts to Natural Resources of Anza-Borrego Desert State Park (ABDSP):

1. Disruption of wildlife corridors for desert bighorn sheep.
2. Adverse effects to golden eagles due to the birds striking the turbines.
3. Adverse impacts to burrowing owls, long-eared owls, Vaux's swift, peregrine falcons, flat-tailed horned lizards, barefoot geckos, Red diamond rattlesnakes, American badgers, and several listed plant species.
4. Could cause significant deaths of bats due to the drop in air pressure causing internal hemorrhaging in the lungs as well as deaths from direct strikes.
5. Unavoidable impact to plants during construction and the introduction of invasive plant species.
6. Permanent scarring to the landscape leaving an "industrial" look to the area.

P130-01

Impacts to Cultural Resources of ABDSP:

1. Visual impacts to the newly designated Cultural Preserve at Piedras Grandes, just west of Ocotillo and its "sacred site."
2. No adequate accounting for impacts to the multiple cultural resources of the area when viewed as a cultural landscape.
3. Cultural Studies not completed prior to assessing impacts.

P130-02

Other Potential Impacts

1. Substantial increase in noise levels from the operation of the turbines, especially at night in surrounding areas.
2. Impacts to air quality from truck traffic and from concrete batch plants.
3. Increased risk of wildfire hazards.
4. Loss of soil's ability to absorb carbon from scraping.
5. Degradation to the recreational and natural experience of ABDSP by the sight of the turbines and associated facilities.
6. Loss of dark night skies.
7. Degradation of wilderness character of the several BLM wildernesses surrounding the proposed project.

P130-03

The NEPA (Environmental Protection Agency) Document does not include an alternative for production of renewable energy at point of use in cities and thus the Draft EIR/EIS is incomplete.

P130-04

P130-04, cont.

Please adopt the "no project" alternative and protect this important desert habitat from devastation by private industry for private profit!

Sincerely,

Barbara M Tracy

Barbara M. Tracy
10418 Lesterford Avenue
Downey, California

Comment Letter P131

RECEIVED
BUREAU OF LAND MGMT.
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11 OCT -3 PM 4:24

CALIF. DESERT DISTRICT
MORENO VALLEY, CA

September 29, 2011

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Re: Opposition to the Ocotillo Express Wind Turbine Project

Dear Mr. Perry,

I am writing to ask you to please adopt the "no project" alternative to this terrible idea of the Ocotillo Express Wind Turbine Project. The Anza-Borrego State Park is a treasured resource that is not isolated from its surroundings. This project would seriously damage the park. In addition, it will disrupt wildlife corridors for desert bighorn sheep, scar the landscape permanently, damage the local populations of many forms of wildlife, and seriously mar the visual landscape in this area where people visit to be refreshed by the vistas. In addition, the draft Environmental Impact Study does not even include superior alternative approaches, such as local energy generation at the point-of-use. **P131-01**

We visit the Park every winter, driving over 600 miles from Northern California to draw sustenance from the beauty of this area. We have hiked many of its trails and enjoyed taking pictures of its beauty, sharing it with friends and family on our return. We are healthier and happier because of these trips. We have wind-farms up north here, and if I would see such mechanisms near the Park it would seriously damage the quality of our visit. **P131-02**

Thanks to other people who are opposed to this project, here is a succinct summary of the issues I have with this project.

Impacts to Natural Resources of Anza-Borrego Desert State Park (ABDSP):

1. Disruption of wildlife corridors for desert bighorn sheep.
2. Adverse effects to golden eagles due to the birds striking the turbines.
3. Adverse impacts to burrowing owls, long-eared owls, Vaux's swift, peregrine falcons, flat-tailed horned lizards, barefoot geckos, Red diamond rattlesnakes, American badgers, and several listed plant species.
4. Could cause significant deaths of bats due to the drop in air pressure causing internal hemorrhaging in the lungs as well as deaths from direct strikes.
5. Unavoidable impact to plants during construction and the introduction of invasive plant species.
6. Permanent scarring to the landscape leaving an "industrial" look to the area.

P131-03

Impacts to Cultural Resources of ABDSP:

1. Visual impacts to the newly designated Cultural Preserve at Piedras Grandes, just west of Ocotillo and its "sacred site."
2. No adequate accounting for impacts to the multiple cultural resources of the area

P131-04

P131-04, cont.

when viewed as a cultural landscape.
3. Cultural Studies not completed prior to assessing impacts.

P131-05

Other Potential Impacts:

1. Substantial increase in noise levels from the operation of the turbines, especially at night in surrounding areas.
2. Impacts to air quality from truck traffic and from concrete batch plants.
3. Increased risk of wildfire hazards.
4. Loss of soil's ability to absorb carbon from scraping.
5. Degradation to the recreational and natural experience of ABDSP by the sight of the turbines and associated facilities.
6. Loss of dark night skies.
7. Degradation of wilderness character of the several BLM wildernesses surrounding the proposed project.

P131-06

The NEPA (Environmental Protection Agency) Document does not include an alternative for production of renewable energy at point of use in cities and thus the Draft EIR/EIS is incomplete.

Please adopt the no-project alternative and protect 12,000 acres of intact desert habitat from destruction for private profit on a project that will be de-commissioned in 30 years! If this project goes through, there will be irreparable damage to the landscape.

Sincerely,

Graeme Kinsey
8625 Ruby Crest Ct.
Elk Grove, CA 95624
graemeki@hotmail.com

Comment Letter P132

RECEIVED
BUREAU OF LAND MGMT.
MAIL ROOM

11 OCT -3 PM 4:25

CALIF. DESERT DISTRICT
MORENO VALLEY, CA

September 29, 2011

California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Cedric Perry:

We are long-time lovers of Anza-Borrego State Park and Borrego Springs. We visit the area several times a year for activities such as four-wheel-drive trips, outdoor photography, nature walks, and birding. Borrego is the place we go for rest and relaxation in a pristine desert habitat.

We are dismayed to learn that the beautiful, unspoiled desert that means so much to us is under threat by the proposed Ocotillo Wind Energy Facility. The impacts on the area's viewshed, soils, and plant and bird life would be especially significant.

It is also extremely disturbing to realize that the dark skies for which the Borrego region is famous would be permanently impacted by this project. The impacts of noise and fire danger are also of grave concern.

We are aware that the Draft EIR/EIS is incomplete and does not meet NEPA requirements because it *lacks a full range of alternatives*, namely, the alternative of producing renewable energy on rooftops in the cities where the energy is used. **This project is simply not needed.** Local rooftop and local distributed renewable energy generation could power the 140,000 homes that this project is slated to power.

We urge the BLM to adopt the no-project alternative and protect 12,000 acres of intact desert habitat from destruction for private profit on a project that will be de-commissioned in just 30 years. We need long-term solutions to California's energy needs, and this project is not one of them.

If this project were built, the reasons why we visit Anza-Borrego would be severely compromised. It is our belief that if the BLM does not kill this wind turbine project, the BLM will literally be killing the town of Borrego Springs—a town that bases its entire existence on the value of its pristine environment and desert tourism.

P132-01

Sincerely,

Cynthia Anderson Bill Dahl

Cynthia Anderson and Bill Dahl
5524 Grand Ave.
Yucca Valley, CA 92284

Comment Letter P133

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11 SEP 30 PM 4:05

CALIF. DESERT DISTRICT
MORENO VALLEY, CA

September 29, 2011

To: Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

From: Cynthia Collins
1150 Anchorage Lane #314
San Diego, CA 92106

CC: State Clearinghouse

Dear Mr. Perry,

I am writing to you today in regards to the proposed Ocotillo Wind Energy Facility.

I am absolutely against it!

I live in the Point Loma area of San Diego and the Anza Borrego State Park is what I consider my backyard. I was introduced to the beauty, animal and plant life there in 2004 after the Cedar Fires. Before that I hiked in the mountain and costal areas, but after the fires many of the mountain trails were closed. My attention turned to the desert. **I have fallen in love!**

I have hiked Maiden Hair Falls, Hawk Canyon, Canyon sin Nombre and parts of the Pacific Crest Trail. I have been to the lowest point and the highest point of the San Andreas Fault. I have seen rare Elephant Trees and the largest tree in the desert, Washington Fan Palms in Torote Bowl. I have visited the Sonny Bono Salton Sea NATIONAL Wildlife Refuge and the Pumpkin Patch. I have seen desert bighorn sheep, hawks and geckos at Palm Canyon. The desert if full of life both large and small and my list could go on and on and I haven't even mentioned the desert wildflowers!

P133-01

I have met many dedicated volunteers, rangers, administrators, donors and guests. All are passionate about this area that is so important. The Park offers wonderful educational experiences for children and adults alike.

I can't image the disruption in wildlife, scarring of the landscape, and destruction of Native American "sacred sites" this project would cause. Once it is gone it is gone and loss would be great.

I firmly believe this is not the answer and more research needs to take place on discovering alternative energy producing means. Lets protect our environment and not destroy it! If this project goes through it will cause irreparable damage to the landscape, plants, and animals of the area.

Your understanding and support is so crucial at this time! And I invite to take you out on a hike and share with you my passion and love for this area! Let me introduce you to one of our regions most beautiful and magical areas!

Sincerely,
Cynthia Collins

Cynthia Collins

Comment Letter P134

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lag
Moreno Valley, CA 92553

RECEIVED
BUREAU OF LAND MGMT.
MAILROOM
11 OCT 13 PM 4:15
CALIF. DESERT DISTRICT
MORENO VALLEY, CA

Dear Mr. Perry,

I am wrighting to you concerning the proposed Ocotillo Wind Turbine project. As a frequent visitor to the southeastern corner of Anza Borrego Desert State Park and the adjoining Yuha Desert I believe that this project would be a tragic mistake. It would cause irreparable harm to the wildlife there as well as ruine the pristine beauty of the area. Thank you for your consideration of this matter.

P134-01

Sincerely,

Richard Tanner

RECEIVED
BUREAU OF LAND MGMT.
11 AUG 31 AM 11:28
CALIF. DESERT DISTRICT
MORENO VALLEY, CA

August 24, 2011
Bureau of Land Management

Re: Proposed Ocotillo Express Wind Project/Imperial County

I would like to address the "alternatives" portion of the Environmental review. For about 5 years now the CPUC has been aware of the work of both Bill Powers and Jim Bell of San Diego and their sustainability plans for the region. Their suggested 'alternatives' to large wind and solar projects is to place solar panels on existing structures as suits the communities which they serve.

In Jim Bell's alternative plan he has asked for a "proof of concept" project which has been considered by the community of Chula Vista in San Diego. No where could this "proof of concept" project be better placed than in El Centro, king of the sun's energy.

Existing rooftops provide the structure without additional damage to soil, plant and animal kingdoms. To build roads and platforms for renewable energy when platforms exist in the form of buildings, seems a bit absurd.

Why would we kill thousands of birds and bats, and countless other creatures when we could be accepting Rooftop Solar on existing rooftops throughout Imperial and San Diego Counties? Could it be because our energy companies will make money building needless additional transmission lines which will connect all of these badly placed energy projects to the grid of the Sunrise Powerlink? The people of El Centro have more than enough transmission lines in their community.

It's really very easy. Put people to work creating rooftop solar energy; keep money in your community pockets, and out of the hands of our current BIG ENERGY COMPANIES- haven't they had enough of our money in rate payer dollars already? Let's become energy independent together; independent of the large companies who control our energy future.

P135-01

See www.jimbell.com and www.borderpowerplants.org

Kathleen Beck
Communities United for Sensible Power
P.O. Box 344
Santa Ysabel, Ca 92070

Perry, Cedric C

From: fred fernandez <frd_fernandez@yahoo.com>
Sent: Monday, October 03, 2011 6:15 PM
To: Perry, Cedric C
Cc: jackterrazas@co.imperial.ca.us; angelinahavens@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Subject: Ocotillo Express Wind Project

I am opposed to this project. While I understand that we need to create more of these type of energy systems, we must avoid putting them in places that are as delicate as these areas. Please find a better alternative location. **P136-01**

Sincerely
Fred Fernandez

Comment Letter P137

Perry, Cedric C

From: Fred Lamb <fred@fredlambdesign.com>
Sent: Monday, October 03, 2011 5:44 PM
To: Perry, Cedric C
Subject: Ocotillo Wind Project

Dear Mr. Perry,
I have just become aware the Ocotillo Express Wind Project in the Anza Borrego Desert. I visit the Borrego Desert three to four time a year, beginning in the spring and have for more than 35 years. I never tire of this natural treasure and its majestic beauty. I respectfully ask that you consider a different location for the wind project to preserve this unique area for my grand children and their children. This area is irreplaceable and once gone, gone forever. I support those who work tirelessly to protect the world's natural wonders like Borrego and will continue to do so. Please consider what the world will lose if this and other natural wonders are simply covered over with "progress". There are many other locations that will serve the wind project.
thank you,
Fred Lamb

P137-01

Perry, Cedric C

From:	gidon singer <gidonsinger@gmail.com>
Sent:	Monday, October 03, 2011 12:12 PM
To:	garywyatt@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; johnrenison@co.imperial.ca.us; angelinahavens@co.imperial.ca.us; Perry, Cedric C; michaelkelley@co.imperial.ca.us; raycastillo@co.imperial.ca.us; terryweiner@sbcglobal.net
Subject:	Ocotillo Express Wind Project

To the BLM I strongly recommend **not** approving the Ocotillo Express Wind Project

The project would:

- *Devastate vital habitat for the Endangered Peninsular bighorn sheep, and the flat-tailed horned lizard — a perennial candidate for listing under the Endangered Species Act.*
- *Add significantly to the cumulative impact on the above species from other energy and agricultural projects in the area.*
- *Pose a serious threat of injury and death to golden eagles and other raptors known to live in the area, as well as the LeConte's thrasher, burrowing owls, several other sensitive birds species, and as many as twelve species of bats.*
- *Forever alter the wild character of the southern parts of Anza-Borrego Desert State Park, destroying its recreational qualities.*
- *Desecrate ancient Native cultural sites in the the Yuha Desert cultural area, and interfere with the work of the soon-to-be-opened Imperial County Desert Museum.*
- *Turn the town of Ocotillo from a quiet, bucolic desert refuge to an industrial zone full of deafening noise 24 hours a day.*
- *Illegally alter the landscape surrounding the protected Juan Bautista de Anza National Historic Trail.*
- *Devastate those parts of Imperial County's economy that depend on tourism in the unspoiled desert*

P138-01

The Draft EIR/EIS is deficient because:

- *It does not include a "Distributed Generation" alternative*
- *Public comment was shortchanged due to a truncated "scoping" process*

P138-02

THE BLM should:

- *Adopt the "no project" alternative*
- *Extend the public comment period by at least 30 days*
- *Hold additional public scoping meetings at which public statements would be allowed.*

P138-03

I have frequented this area since I was a child in the 1970's for hiking, backpacking trips. The area's natural beauty is unique and should not be destroyed for an ill planned project which is less aobut renewable energy and more about privatization of public lands for the financial benefit of a few, whilst ruining critical habitat,view corridors, and setting a horrible precedent.

P138-04

thank you Gidon Singer

Perry, Cedric C

From:	Nick Ervin <desertguy1@sbcglobal.net>
Sent:	Tuesday, October 04, 2011 11:22 AM
To:	Perry, Cedric C
Subject:	Ocotillo Wind/Express Proposed Project

Dear Mr. Perry:

As a former member of the BLM's California Desert District Advisory Council (1995-2000), I feel compelled to write you about this proposed project. I have explored the California desert for well over 30 years and the proposed project area is in the region of the desert closest to my home in San Diego. I have driven by the area literally hundreds of times since 1978 plus I have hiked and camped in it at various times over that period. I know it well.

As noted by the Conservation Biology Institute's analysis of the area, it is a key wildlife corridor linkage constituting an invaluable ecotone; it is home to several key and declining species. This is an extremely valuable habitat with very high values being on the edge of Baja California, the Jacumba Mtns. complex and Anza-Borrego Desert State Park. Thus, aside from an array of public health concerns for nearby human beings in Ocotillo/Nomirage from such a density of huge wind turbines, such proposed use is highly incompatible with its other values. It would kill raptors and other avian species at alarming rates based on experience with other such projects. It is a completely UNACCEPTABLE proposal.

I urge BLM in the strongest possible terms to select the "No Alternative" option in the EIR/EIS.

Very Truly Yours.

H. Nick Ervin

Former Member, BLM California Desert District Advisory Council

P139-01

Perry, Cedric C

From:	Pelican Network <CoastalHabitat@PelicanNetwork.net>
Sent:	Tuesday, October 04, 2011 10:37 AM
To:	Perry, Cedric C; angelinahavens@co.imperial.caus; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us; conrad@theabf.org
Cc:	info@theabf.org; Laura Cunningham; Chris Clarke
Subject:	Oppose Wind Ocotillo Wind Project

Dear Bureau of Land Management and County of Imperial Planning,
Please do not allow the ill-conceived Ocotillo Express Wind project.
It is proposed next to the magnificent Anza Borrego State Park - a magical place that must be treasured, not devastated by an mammoth industrial energy generation project. The proposed project causes harm to all Californians as this desert habitat is precious and uniquely instructive scientifically, culturally and spiritually. **P140-01**

pelicannetwork .net

Jack Ellwanger, PelicanNetwork
PO Box 144
Big Sur, CA

PelicanNetwork A 5,000 + member volunteer advocacy for natural and cultural history education.

Perry, Cedric C

From: john <john@unionarch.com>
Sent: Monday, October 03, 2011 2:42 PM
To: Perry, Cedric C
Subject: wind power project

Dear Cedric.

As someone who has camped in this area the past couple of years I am disheartened at the proposed installation of 155 wind turbines. The mountains to the west giving away to the vast low lying desert is an unique landscape. I can testify to the abundance of wind by the amount of sand in my crevices after camping. Whew. But the amount of turbines in this proposal seems to be a prelude to more in the future. (similiar to the growing number of turbines in the Palm Springs area.)

Since no other alternative is proposed in the NEPA I would have to oppose this installation as it now stands. Perhaps certain locations and a limited number might be acceptable in future proposals. One key factor in the design would be to use a derrick structure below the turbine.

P141-01

These derricks type structures in Palm Springs produce much less impact on the landscape than the monolith single pole type.

Please reconsider your proposal and keep the beauty of the desert in place. I would lose another camping area to development.

Yours,
John

John H.Eisenhart Architect
Union Architecture
1530 Brookes Ave.
San Diego,CA. 92103
619-269-4941
www.unionarch.com

Perry, Cedric C

From: Kevin Walsh <kawalsh1@cox.net>
Sent: Tuesday, October 04, 2011 12:42 PM
To: Perry, Cedric C
Subject: Ocatillo wind energy facility

Hello Mr. Perry,
I am writing to express my concern regarding the Ocatillo wind project. Its proximity to the Anza Borrego State Park raises numerous questions regarding its effect on the park. I can attest to the popularity of this part of the park as I have been going there regularly for over 15 years. I am not against wind power, but I would want to know that the Park will be in no way impacted by this project. **P142-01**
Thanks for your consideration,
Kevin Walsh
San Diego, CA

Perry, Cedric C

From: Kristina Rood <kris.rood@yahoo.com>
Sent: Tuesday, October 04, 2011 12:33 PM
To: Perry, Cedric C
Subject: Ocotillo Wind project

Please do not issue a permit to allow this construction. As a resident of Borrego Springs, this construction threatens too seriously impact our peaceful desert environment in countless ways. I urge you to please deny this project. **P143-01**

Sincerely yours,

Kristina Rood

Comment Letter P144

Perry, Cedric C

From: Lee <cloler@cox.net>
Sent: Monday, October 03, 2011 10:17 PM
To: Perry, Cedric C
Cc: angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us; conrad@theabf.org; CHRISTINE LEE OLER
Subject: My comments on the proposed Ocotillo Express Wind Energy Project

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov

Mr. Perry,

The proposed Ocotillo Express Wind Farm is way too close to Anza-Borrego State park.

The project, if built, would harm many species of wildlife in the area. Some are candidates for the endangered species list. Some are already on the endangered species list. Also put in harms way would be ,many species of raptors and bats. **P144-01**

There are many other reasons to propose the "no project" alternative. It does not include a "Distributed Generation" alternative. The public comment was shortchanged due to a truncated "scoping" process. Please extend the public comment period by 45 days. Hold additional public scoping meetings at which public statements would be allowed. **P144-02**

The proposed wind farm would interfere and desecrate cultural archaeological sites. **P144-03**

Surely, further study will enable the Ocotillo Express wind energy Project to locate a a more fitting location for its Project. Adjacent to the Anza-Borrego State park is not the place for this project.

I have visited Anza-Borrego State Park many times. It is a beautiful area with many different types of topography and life zones. Please locate the wind farm a respectful distance from A-B State Park. **P144-04**

Please make my statement part of the record. **P144-05**

Sincerely,

Lee Oler

207 W Dahil Road
Tucson AZ 85705

Perry, Cedric C

From: Les Doak <lldoak@msn.com>
Sent: Monday, October 03, 2011 5:38 PM
To: angelinahavens@co.imperial.ca.us
Cc: Perry, Cedric C
Subject: Opposition to Ocotillo Express Wind Project

Dear Supervisors - Please accept this letter of opposition to the Ocotillo Express Wind Project. This magnificent, awesome, remote, and achingly beautiful area of our wonderful State of California would be irreparably harmed by having this blight on the landscape. There are other perfectly suitable sites for such a project. How can it be considered a "Green" project when it destroys such natural beauty? I have visited, camped in and traveled throughout our desert areas immediately affected, and cannot support this project. I firmly oppose the Ocotillo Express Wind Project. Respectfully, Les Doak

P145-01

Perry, Cedric C

From:	Leslie <bellah@myusacomm.net>
Sent:	Monday, October 03, 2011 6:51 PM
To:	Perry, Cedric C; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; angelinahavens@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us; conrad@theabf.org
Subject:	Ocotillo Express Wind Project

Greetings,

I am totally against the Ocotillo Express Wind Project for many reasons (bats, birds, aesthetics), but especially because it is adjacent to the largest and most diverse state park in California. This park is designated as part of the world's biosphere reserve. We can't allow this right next to such an incredibly beautiful and fragile place as Anza-Borrego Desert State Park. **P146-01**

This project will devastate vital habitat for the Endangered Peninsular bighorn sheep and the flat-tailed horned lizard. It will pose a serious threat of injury and death to golden eagles and other raptors in the area, as well as the LeConte's thrasher, burrowing owls, other sensitive birds species and as many as twelve species of bats. It will desecrate ancient Native American cultural sites in the the Yuha Desert cultural area and compromise the work of the soon-to-be-opened Imperial County Desert Museum. It will turn the town of Ocotillo from a quiet, bucolic desert refuge to an industrial zone full of deafening noise 24 hours a day and ruin the now-limitless views of the desert forever. It will illegally alter the landscape surrounding the protected Juan Bautista de Anza National Historic Trail. **P146-02**

The draft EIR/EIS does not include a distributed generation alternative nor did it allow for public comment.

I would hope the BLM will adopt the "no project" alternative, extend the public comment period by at least 30 days and hold additional public scoping meetings where we (the public) can voice our opinions. **P146-03**

This part of the desert is a secret kept from those who only drive by it. I have spent many, many days hiking, exploring and driving in this area. There are many interesting and precious acres of animals and plants that we will never be able to enjoy again if these wind machines are erected. I am in favor of solar power which is ugly enough, but these machines are killers for bats and birds. Being so close to one of the major avian migratory routes in the United States makes consideration of this project totally wrong. **P146-04**

Please find something else, somewhere else.

Leslie Bellah

P.O. Box 177

Borrego Springs, CA 92004

Perry, Cedric C

From: Lisa Spoon <lcspoon@live.com>
Sent: Tuesday, October 04, 2011 1:17 PM
To: Perry, Cedric C; angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us; conrad@theabf.org
Subject: Ocotillo Express Wind Project

To Whom It May Concern,

Please consider my opposition to the Ocotillo Express Wind Project. I urge the BLM to adopt the "no project" alternative, extend the public comment period, and hold additional public scoping meetings. **P147-01**

The Draft EIR/EIS is deficient because it does not include a Distributed Generation alternative and public comment was shortchanged due to truncated procedures. **P147-02**

This project is destructive on many levels: **P147-03**

1) It is deadly to the wildlife habitat of the endangered peninsula big horn sheep, the flat tailed horned lizard, several species of
   bats, the golden eagle and other sensitive raptor and bird species.
2) It will desecrate ancient Native American cultural sites.
3) It will change the quiet desert town of Ocotillo into an industrial zone of 24/7 noise.
4) It will ruin the parts of Imperial County's economy that depend on tourism in the unspoiled desert.

Your attention is greatly appreciated.

Regards,

Lisa Spoon
POBox 1497
Borrego Springs, CA 92004
858-699-8302

Comment Letter P148

Perry, Cedric C

From: Lynn Teel <TEEL140@roadrunner.com>
Sent: Tuesday, October 04, 2011 10:47 AM
To: Perry, Cedric C
Subject: wind devices

Lynn T. Teel
2010 Silver Oak Way
Hemet, Ca. 92545

To all whom it may concern:

I am writing this concern for the protection of a vast area of wilderness that does not need to be subjected to man made objects that not only offend the natural landscape of this area, but destroys its natural beauty. The placement of said wind devices are simply an eye sore. For example the wind devices along interstate 10 toward Palm Springs--yuck! What more can I say.

Being a retired maintenance Worker 1 and have had the experience of working within the Anza Borrego Desert State Park understands the need of a protected wilderness for people to come and visit and enjoy the natural habitat of what the park stands for. People who need to see and experience its awesome natural beauty not yet destroyed by man who wish to add objects that this vast land can do without. **P148-01**

The need for these so called wind devices is grossly over rated. The need for supplying power to an additional 140,000 homes anywhere is this area is way out of line. I do not know of the exact count of homes already in and around this area, but I am aware it is far less. **P148-02**

Adding these wind devices not only destroys the natural beauty of the landscape, but poses danger to the wild life that live and survive in this wilderness--for example, death to golden eagles and other raptors that survive in the area--such as the LeConte's thrasher, the burrowing owl-my favorite and many other bird species,and lets not leave out several bat species. The addition of these devices will have a future impact on ancient Native cultural sites and National Historic Trails and the addition of noises and pollution in all areas concerned. **P148-03**

The bottom line is simply this, the wilderness of the park system is for the people to enjoy, intact as it was created by nature. The people who enjoy coming to these parks have only a small impact of the natural beauty but add to the economy of the small towns and businesses. When you add growth and take away the small community atmosphere, you loose this. The concept of adding wind devices to service future growth in an area like this, is ridiculous. **P148-04**

As a future visitor of any state park system and especially the desert wilderness that I care for, I strongly protest the addition of these so call wind devices.

Sincerely, Lynn T. Teel

Ocotillo Express Questions and Concerns January 2011

P149-01

I am a resident of Ocotillo California and have many concerns about this proposed project. I am for any type of green power we as Americans can develop. However this project has several concerning issues that have been identified in some articles as well as some of my personal concerns as a voting, tax paying citizen of Imperial County California. I would like to start by defining the meaning of the word "conservation".

World English Dictionary

conservation (□kɒnsə□veɪʃən) ?

—*n*

1. the act or an instance of conserving or keeping from change, loss, injury, etc
2. a. protection, preservation, and careful management of natural resources and of the environment
   b. (*as modifier*): *a conservation area*

P149-02

I believe that this should be the first concern that many in private industry are driven by billions of dollars to be made from this project while the residents of Ocotillo gain nothing.

P149-03

Property values will be negated to almost nothing. Tax dollars lost by the county once the properties have been reassessed after the project. Nobody will want to develop, invest in, or live near this area.

P149-04

Quality of life living near these wind turbines will be affected with the view of the mountains. Exposure to the massive amounts of noise from the turbines, construction, high frequencies noise, dust and related dust spoors that could lead to cases of Valley Fever.

Wildlife concerns. Golden Eagles that are seen in and near Ocotillo. I believe that these are protected by the federal government. Desert Tortoise, also a federally protected species. Peninsular Big Horn Sheep also protected by the government. Flat tailed horned lizard also protected. All will have disruption and changes to their environment. **P149-05**

Economic concerns. There will be almost no jobs created locally. The average age is early 50's and most have moved here for reasons of their own and would not work for this project. There is not a skilled labor force in the town of Ocotillo. The contactor for the construction of this proposed project will bring in the crews and sub contractors that specialized in this very dangerous construction project. What positions will be open for local employment? How many? **P149-06**

Water concerns. Our local water supply with the Ocotillo Mutual Water Company as well as the Coyote Mutual Water Company have always had concerns as diminishing water resources. How should that be addressed. The amount of water they propose is times more than our annual residential usage. Where would this proposed project get water for the batch plants and concrete construction? Will they deplete our water resources? **P149-07**

FEMA Flood zone. FEMA a federal agencies has stopped any and all development on private property in the flood plain yet there they are proposing wind generators in that FEMA flood plain. How can this happen? **P149-08**

Recreational issue. Who will want to investigate a wind farm? We have many campers, hikers, nature exploring individuals, cyclist, wildflower viewers, ORV users of public land for which they support keeping areas open via Green Sticker fees. All of these people generate income for the local vendors in Ocotillo. Who is looking out for the conservation of this area for all of these folks? **P149-09**

Cultural issues. Not even known at this point what impact that will have. DeAnza made his historical exploration of this area bringing the east to the west. All major historical facts and Indian artifacts. We see evidence of past Indian activity all around this area. Who is going to conserve this for future generations? What is the positioned of the Indians on this proposed project? **P149-10**

This proposed project will encompass almost 300 degrees of the town of Ocotillo. There are better options more suitable for Pattern Energy and SDG&E. Move this project south of Highway 98 along the US/Mexican border. Move it to Mexico to off set the "dirty" power plant that SDG&E built in Mexico to avoid US emission regulations to get cheaper power they could charge more for. We know there is many more wind generators proposed for Mexico. Move all of them there. Move them to the Davies Valley area that is not visible and accessible today, if they are not going to have an effect on the environment that would be the best area for this proposed project. **P149-11**

Is there a signed contract with the two parties for this project? Pattern Energy and SDG&E P149-12

Will the County of Imperial require the changes for S2? Turn out lanes? Curbs? Gutters for rain run off? Side walk for all of the area within the proposed project area? P149-13

Will FEMA revise or require changes to the flood plain? Construction regulations in the flood plain will change? P149-14

What findings did the "Desert Advisory Council" have to approve this proposed develop ment of public land and it's location in a Conservation area? P149-15

When out in this area I see many areas closed for "Sensitive Wilderness area" Is it not a sensitive area? Have we all been lied to just to take more land away from us? P149-16

What about Environmental Justice? Protect those who are in this area that can not protect them selves for big industry. P149-17

Truck traffic and diesel exhaust fumes. It will take 4 to 6 trucks per wind generator for the delivery and many more to service them during the life time of the project. The blades must be maintained because of stress the crack and have been known to fly apart during storms. I have been told that the blades at some point become hazardous waste and nothing can be done with them. More waste for the desert area. P149-18

Septic concerns. How will they deal with septic needs? How can they get permitted for septic in such a sensitive area? P149-19

Wind Generators reliability. It has been proven world wind that wind generation is not a reliable source of renewable energy. It will never follow demand and in most cases needs a separate power plant to keep the grid fed. It has been proven that the reduction of other fuel supplied grids show little to no reduction in fuels used to produce power with the addition of wind generators in the grid. P149-20

This is not just some dried up remote desert area with little to no effect on so many issues. I know that with enough money and power all of these concerns will be answered. But who will they look to and say "who let them to this to a Conservation Area" There are too many other locations in Imperial County to locate such a project with no effect on humans. Please protect us and our environment it can not possibly be "green" with so much negative impact of just the few items I have noted. I would love to get 15000 acres of preserve land to develop with almost no cost when I stand to make billions at the cost of the land. P149-21

Do the right things stop this proposed project before it moves any farther and protect this area for future generations as you are required to do in a "Conservation Area" P149-22

Regards Mark Meech

US Fish and wildlife states factors to consider when assessing effects. Species that are rare or cryptic; that migrate, conduct other daily movements, or use areas for short periods of time; that are small in size or nocturnal; or that have become extirpated in parts of their historical range will present particular challenges when trying to determine potential presence. One of these challenges is "migration," broadly defined as the act of moving from one spatial unit to another (Baker 1978), or as a periodic movement of animals from one location to another. Migration is species-specific, and for birds and bats occurs throughout the year. Such moments should be considered for all potentially affected species, including flying insects and species that migrate on the ground.

Wind developers need to determine not only what species may migrate through a proposed development site and when, but also whether a site may function as a staging area or stopover habitat for wildlife on their migration pathway. For some species, movements between foraging and breeding habitat, or between sheltering and feeding habitats, occur on a daily basis. Consideration of daily movements (morning and evening; coming and going) is a critical factor when considering project development. **P150-01**

Collision and Barotrauma

The services concerned about effects to birds and bats from collision and barotrauma caused by moving blades and wind wake turbulence. Collision likelihood for individual birds and bats at a particular wind energy facility may be the result of complex interactions among species distribution, "relative abundance," behavior, visibility, weather conditions, and site characteristics.

Along with the observed direct fatalities from barotrauma, there may be lesser injuries, such as hearing impairment and other internal injuries that may allow the bats to fly or otherwise move away from the vicinity but would ultimately result in their death (Kozuka et al. 1997). As a result, estimates of bat fatalities from carcass searches may underestimate total fatalities. **P150-02**

Barrier Effects

"Barrier effects" can occur when a species' avoidance of wind facility results in decreased movement or an increase in energy use to circumvent the facility. (Goodale and Divoll 2009). Avoidance of the area may also occur as a result of noise or habitat loss due to construction of roads and other structures associated with facility development (Fox et al. 2006). The level of barrier effect depends on species, turbine layout, size of wind facility, season, and the species' ability to compensate for losses in energy due to avoidance, among other variables (Langston and Pullan 2003; Fox et al. 2006). Though populations-scale effects currently have not been documented, scientist are concerned that "barriers" between breeding and feeding areas may have significant effects (Fox et al 2006; Goodale and Divoll 2009; Drewitt and Langston 2006). The combined barrier effect of multiple wind facilities is also a **P150-03** concern as wind energy development becomes more prevalent (Drewitt and Langston 2006). The barrier effect has been documented fairly extensively in several offshore wind projects (Guarnaccia and Kerlinger 2007) where modified behaviors by various bird species have been recorded at distances of between 100 m and 3 kilometers from turbine arrays (Drewitt and Langston 2006; Exo et al. 2003; Desholm and Kahlert 2005; and Percival 2001). P150-04

Habitat loss and degradation

Wind project development results in direct habitat loss and habitat modifications, especially at sites previously undeveloped. Many of North America's native landscapes are greatly diminished or degraded from multiple causes unrelated to wind energy. Important reminiscence of these landscapes are identified and documented in various databases held by private conservation organizations, state wildlife agencies, and, in some cases, by the service. Species that depend on these landscapes are susceptible to further loss of habitat, which will affect their ability to reproduce and survive. While habitat loss due to footprints of turbines, roads, and other infrastructure is obvious, less obvious is the potential reduction of habitat quality. P150-05

Habitat Fragmentation

Habitat fragmentation separates blocks of habitat for some species into segments, such that the individuals in the remaining habitat segments may suffer from effects such as decreased survival, reproduction, distribution, or use of the area. Site clearing, access roads, transmission lines, and arrays of turbine towers may displace some species or fragment continuous habitat areas into smaller, isolated tracts. Habitat fragmentation is of particular concern when species require large expanses of habitat for activities such as breeding, foraging, and sheltering. P150-06

Noise

Turbine blades at normal operating speeds can generate levels of noise beyond ambient background levels. Construction and maintenance activities can also contribute to noise levels by affecting communication distance, an animal's ability to detect calls or danger, or to forage. Noise associated with developments can also cause behavioral and/or physiological effects, damage to hearing from acoustic over-exposure, and masking of communication signals and other biologically relevant sounds (Dooling and Popper 2007). Some birds are able to shift their vocalizations to reduce the masking effects of noise. However, when shifts don't occur or are insignificant, masking may prove detrimental to the health and survival of wildlife (Barber et al. 2010). Data suggests noise increases of 3 dB to 10 dB correspond to 30 percent to 90 percent reductions in alerting distances for wildlife, respectively (Barber et al., 2010).

The surveys cannot possibly cover all the ground and area that these projects impact with only a ten week survey. The surveyors would need to live within the area for several years to see the varying wildlife out here as they can be elusive. P150-07

Indirect Effects

Wind development can also have indirect effects to wildlife habitats. Indirect effects include reduced nesting and breeding densities and the social ramifications of those reductions; loss or modification of foraging habitat; loss of population vigor and overall population density; increased isolation between habitat patches, loss of habitat refugia; attraction to modified habitats; effects on behavior, physiological disturbance, and habitat unsuitability. Indirect effects can result from introduction of invasive plants; increased predator populations for facilitated predation; alterations in natural fire regime; or other effects, and can manifest themselves later in time than the causing action. **P150-08**

Source USFW website: www.usfw.gov

Visual

The project would substantially degrade the existing visual character or quality of the site and its surroundings. This would seriously downgrade many property values as they were appraised and purchased for their visual quality. This would also downgrade its visual quality for recreational use. Many people visiting the Desert come to the area for its scenic vistas, open spaces, and unique visual appeal. **P150-09**

Noise

Noise levels could increase ambient noise from 2 to 3db or greater in some areas. A 3db increase would be doubling of the noise level. Each decibel gain increases logarithmically. The noise would be continuous and not intermittent, such as a passing truck or jet aircraft passing through an area. The noise being continuous would have cumulative impacts to local residents in the affected area. What brand of turbine will be used? Every brand has a different noise rating as well for each model. Again, noise from the turbines would be continuous and would have cumulative impacts on residents. The noise would also create impacts on recreational use as visitors come to the area for the quiet. **P150-10**

Public Health and Safety

Public Health and Safety, EMF needs to be addressed and potential long-term exposure health effects to residents. There should be a condition placed on project that if there is a spike in health problems in the area the causal agents will be removed. Furthermore, ongoing studies should be conducted throughout the life of the project studying the health of residents within the project area. Any health conditions that arise as a result of the project. The companies and approvers of the project will compensate all cost incurred by individual suffering from health conditions. Currently the International Association of Firefighters are looking at standards for fire stations and firefighters exposed to EMFs and RF as there is a concern that there is a potential health risk associated with these exposures. These risks cannot be definitively ruled out as no risk to health, therefore caution needs to be exercised and error towards **P150-11** public health and not driven to financial gain. Also stray voltage needs to be addressed which is caused by motors, switches, switching controls, generators, transformers, and voltage shedding. This could increase the risk to local resident health from stray voltage and excessive EMF exposure.

P150-11, cont.

Social and Economic Conditions Property Value Guarantees need to be in place and addressed.

Chris Luxemburger study was based on a sample of 600 properties that sold in the windmill areas over a period of three years. The results, properties inside the windmill zones were more than double the days on the market than those outside, the sold price was on average, $48,000 lower inside windmill zones than those outside, and the number of homes not sold inside windmill zones was 11% versus 3% outside the zone.

Financial gain to developer and landowner/lessor should not be at the expense of neighboring property owner equity. Since the project developers and the ones approving the project claim property value decrease as not adverse they should be able to back it up with property value guarantees. This should be a requirement or condition. Verbal promises are meaningless and this needs to be a written requirement or condition to back up this claim. The housing market has and is still suffering and does not need more impacts. Anymore devaluation of property values in the area would have a devastating effect on already struggling communities in the project area.

P150-12

Property value guarantee should be based on the following: homeowner option to sell within 3 to 5 miles of wind turbines; based on certified appraisal process; measured against far distant comps and marketing periods; current value at time of option/sale; possible sale leaseback; bonding or adequate insurance, particularly when developer or owner has inadequate assets to guarantee probable range of value loss, insurance prepaid for project life; and decommissioning of turbines bonded; construction of replacement housing and relocation for residents who will be disturbed.

Sources: Micheal S. McCann, CRA McCann Appraisal, LLC mikemccann@comcast.net

Fire

According to reports, the cost of a fire that damages or destroys a wind turbine can be as much as $2 million. Property damage to the turbine, and nearby areas, from fires reported in the past decade range between $750,000 and $6 million. Imminent hazards of a burning turbine can cause the risk of sparks, Embers, or debris falling to the ground and setting off a wildfire due to remote location of many wind farms. Even if the turbine is not fully burned or damaged, or a potential fire doesn't spread to the surrounding countryside, costs can be considerable. Turbine fires and particularly, those that spread should be a significant concern, affecting the planning stages of any project. Technical equipment and combustible material are concentrated in the nacelle and, once a fire starts in a turbine, it can be fueled by up to 200 gallons of hydraulic fluid and lubricants. The nacelle itself is constructed from highly flammable resin and glass fiber, and internal insulation can become contaminated by oil deposits,

P150-13

adding to the overall fuel load. The most common cause of a turbine fire is a lightning strike, a risk that is heightened by the installation of taller and taller wind turbine.

Source: http://northgowerwindactiongroup Wind turbine fires: not "if"-when

Fire and Fuels need to be evaluated by all parties from the Federal, State, and Local Fire Agencies. This project would increase risk to Life and Safety not to mention the revised tactics that would have to be deployed by firefighters due to the turbines. This could also potentially increase insurance cost to local residents. The document needs to address UL6140, UL6141, and NFPA 850 as well as current standards in regards Generating Plants, High Voltage Direct Current Converter Stations, and Wind Turbines.

P150-13, cont.

Cumulative Impacts

A review of all the projects within the geographical area needs to be studied thoroughly, regardless of land jurisdiction or County boundaries. There is a massive amount of projects within Imperial County and San Diego County each within close proximity to each other. The project cannot be looked at singularly when evaluating impacts but as another additional impact to the areas.

P150-14

Mark Ostrander

Jacumba Resident

43577 Old Hwy 80

Jacumba, Calif. 91934

clasictraclayer@att.net

October 3, 2011

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov

We strongly oppose the proposed Ocotillo Wind Energy Facility to be located directly adjacent to the southern border of Anza-Borrego Desert State Park and near San Diego County's Agua Caliente and Vallecito Stage Station Parks. The proposed "industrialization" of the area is not compatible with the wilderness character of the state park and surrounding areas, and will adversely impact wildlife and native plants and the fragile desert itself. As volunteers for State Parks and San Diego County Parks, we are familiar with the cultural resources in this area and believe the project will not only damage the cultural landscape, but also the actual cultural sites themselves. The area is part of the old San Antonio-San Diego Mail Line and the Butterfield Overland Mail Line routes with the remains of former stage stations nearby. **P151-01**

One of the reasons Wind Turbine projects are currently "fashionable" is because fossil fuel projects need to be improved or replaced to prevent depletion of oil resources and the pollution of the environment. This Wind project will irreparably damage one of the few desert Wildernesses left. Don't let "renewable energy" be the excuse for destroying what remains. **P151-02**

Furthermore, the project is not needed. Local rooftop solar energy generation and distribution could provide the power this wind project will provide, and with much less damage to the natural environment. Adequate alternatives have not been studied as part of this proposal. **P151-03**

Please reject this Wind Energy project,

Melvin & Ellen Sweet

1567 Vista Claridad
La Jolla CA, 22037
858-459-7759

Perry, Cedric C

From: nuribpierc@aol.com
Sent: Tuesday, October 04, 2011 1:13 PM
To: Perry, Cedric C
Subject: Ocotillo Express Wind Project

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov

Dear Sir,

It is with great urgency that I send my comments to request that you adopt a NO PROJECT for the Ocotillo Express Wind Project. As a dedicated botanist and bird watcher, I know well the area where this project would be set. It encompasses a major corridor for bird migration where wind turbines would be the very worst idea. In addition, the massive wind turbines and all the crisscrossing of roads as proposed, mean sure death for this valuable ecosystem. The area is particularly valuable because it is still near enough to cities but remains pristine and healthy supporting a large array of wildlife species, among them many raptor species and in particular endangered species like the Big Horn Sheep and the Horned Lizard, their existence precariously hanging on the balance as we implement new measures to try to help them. **P152-01**

Please consider that the wealth of the area must be protected. I am sure that more people will come out against this nefarious project if more time, publicity and unlimited public comments were given to the review process. **P152-02**

As much as we need clean renewable energy, we do not need it at the cost of ruining forever one of the richest areas we have in our county. I remain hopeful that you will stop this proposed planned destruction. **P152-03**

Thank you for allowing me to present my views.

Sincerely,

Nuri Pierce
10746 Melva Rd
La Mesa CA 91941

Perry, Cedric C

From: Paul Zablotny <paulzablotny@hotmail.com>
Sent: Tuesday, October 04, 2011 11:36 AM
To: Perry, Cedric C
Cc: johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; angelinahavens@co.imperial.ca.us; raycastillo@co.imperial.ca.us; conrad@theabf.org
Subject: I am opposed to the Ocotillo Express Wind Energy Project.

October 4, 2011

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov

Dear Mr. Perry:

I am opposed to the Ocotillo Express Wind Energy Project.

The remote, unspoiled, open space that is preserved by the Anza Borrego State Park would be harmed by the view and operation of such a project.

In its current state, the area provides a wonderland of outdoor recreational and learning activities within an easy 1 or 2 hour drive from my home in San Diego. The construction of the project would forever intrude on the beautiful vistas from the mountain tops to the Salton Sea; it would cause harm to the Dark Skies movement that Borrego is famous for; it would become a deterrent to the future clean up of the Salton Sea and block the regions' development as the world class recreational destination it deserves to be.

P153-01

Please adopt the "no project" alternative, extend the public comment period by at least 30 days, and hold additional public scoping meetings at which public statements would be allowed.

P153-02

Sincerely,

Mr. Paul Zablotny

2568 Albatross St. 5A
San Diego, CA92101

paulzablotny@hotmail.com

Perry, Cedric C

From:	Paulette Ache <pauletteache@hotmail.com>
Sent:	Monday, October 03, 2011 9:01 PM
To:	Perry, Cedric C; angelinahavens@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us; terryweiner@sbcglobal.net; jackterrazas@co.imperial.ca.us; johnrenison@co.imperial.ca.us
Subject:	No to Ocotillo Express Wind Project

I'm writing about the proposed Ocotillo Express Wind Project. It's my understanding that 155 wind turbines which are up to 425 feet tall will be arrayed adjacent to Anza-Borrego Desert State Park.

Wind turbines have proven dangerous and deadly to migrating birds, bats and other animals. Golden Eagles, LeConte's Thrashers, Burrowing Owls, Flat Tailed Horned Lizards and the Endangered Peninsular Bighorn Sheep inhabit this critical area.

I urge the BLM to adopt the "no project" alternative and to extend the public comment period by 30 days to make up for limiting public comment at the scoping meetings in August 2011.

P154-01

Thank you for your consideration,

Paulette D. Ache
PO Box 655
Borrego Springs, CA 92004-0655

Perry, Cedric C

From: Ralph Singer <ralphsinger1@mac.com>
Sent: Monday, October 03, 2011 12:32 PM
To: Perry, Cedric C
Subject: Ocotillo Express Wind Turbine Project

Dear Mr. Perry

I am writing to state my opposition to the Ocotillo Express Wind Turbine Project. My opposition is based on a number of issues.
However, my primary concern involves the location of the project as it relates to the distance from the target audience, San Diego. The transmission of the electricity generated by the project will need to be sent great distances and will require an enormous power grid. The same generation of power should be done much closer to the final destination. The principle of distributive power dictates that roof top solar would be far more efficient. Additionally, wind turbines could be erected much closer to San Diego.

P155-01

The project will disrupt many wildlife corridors and would devastate vital habitat for the endangered Peninsular bighorn sheep as well as many other endangered species. The area is a vital foraging ground for the golden eagle. The terrible mortality incurred by this species, as well as many others, as a result of turbine strikes, is well known.

P155-02

The project is slated to have a 30 year life after which, it will be impossible to restore the devastated land to its pristine condition.
It took millions of years to get to be what it currently is.

P155-03

There will be massive impact to the cultural resources of Anza Borrego Dessert State Park, (ABDSP). The visual impact to the newly designated Cultural Preserve at Piedras Grandes just to the west of Ocotillo will be enormous. I do not believe that adequate cultural studies have been completed prior to assessing these impacts.

P155-04

The project would forever alter the wild character of the southern parts of ABDSP , destroying its recreational qualities, and would desecrate ancient native cultural sites in the Yuha Desert cultural area. The project will also interfere with the soon to be opened Imperial County Desert Museum.

P155-05

The desert serenity character of the area would change with the increase in visual and noise level from the operation of the turbines in the surrounding areas. There would be a significant degradation to the recreational and natural experience of ABDSP by the sight and sound of the turbines and associated facilities.

P155-06

I believe that energy should be developed as close as possible to the area where it will be consumed, not hundreds of miles away where it must be transmitted with both a loss in power, and devastating an area which will in no way gain from the process. The town of Ocotillo and the surrounding area including the eastern and southern edge of ABDSP will suffer substantial degradation if this project is permitted to go forward.

I appreciate the opportunity of expressing my opinion that there be NO PROJECT!

P155-07

Ralph Singer
3018 Country Club
Borrego Springs CA
P.O. Box 1492

Perry, Cedric C

From: Rand Newman <rand_newman@yahoo.com>
Sent: Tuesday, October 04, 2011 11:51 AM
To: Perry, Cedric C; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Cc: conrad@theabf.org
Subject: Vote No on Ocotillo Wind Express Project

All:

I have been a loyal supporter and member of the Anza-Borrego Foundation for over fifteen years. I am appalled that the Ocotillo Wind Express Project has been able to garner even a semblance of governmental support.

You should be staunchly opposed to the Project. Placing monstrous wind turbines next to the southeastern border of Anza-Borrego Desert State Park would be a colossal mistake.

The Project EIS is deeply flawed for one simple reason: the Project is the wrong idea in the wrong place. The Park is magnificent, pristine desert habitat that can never be replaced. There is no mitigation possible for such damaging construction.

Everyone wants non-oil energy resources. However, wind turbines are so destructive to the environment, as compared to solar, that their use should be strictly limited to locations with no scenic or esthetic value. It is a gross misnomer to call them "renewable energy sources" since they renew nothing. **P156-01**

The Project would devastate vital habitat for species we must protect, such as the Endangered Peninsular bighorn sheep and the flat-tailed horned lizard. It would also put at serious risk local populations of golden eagles and other sensitive bird and reptile species.

There are few truly wild lands left in San Diego and Imperial Counties. It would be tragic to so severely disturb what little remains. **P156-02**

This project is not only a travesty in terms of substance but also in terms of process. It is completely unfair to artificially shorten the "scoping" process and to not consider "distributed generation" alternatives. **P156-03**

Please vote no on this project. Your grandchildren and their grandchildren will be forever in your debt. **P156-04**

Thank you,
Rand Newman

Perry, Cedric C

From:	Randall Ricketts <rvricketts@att.net>
Sent:	Monday, October 03, 2011 6:27 PM
To:	Perry, Cedric C
Cc:	johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelly@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us; angelinahavens@co.imperial.ca.us
Subject:	ocotillo wind farm

Dear sir's and madam,
I would like to register my opposition to the proposed Ocotillo Express Wind Project. Please adopt a no project stance. This project is too close to one of our states treasures namely the Anza Borrego Desert State Park. This park and the areas surrounding it are special, and require protection. The wildlife, habitat, beauty and serenity that this area offers would be greatly impacted by this project. There are better alternatives. The proposed location would threaten the natural, cultural and recreational resources of this small but important part of the Colorado desert that is so close to and an escape from urban Southern California. As a longtime resident of southern california and frequent visitor to the San Diego and Imperial county deserts I feel we need to be vigilant to protect these remaining "close in" wild areas from further degradation. **P157-01**

Randall Ricketts
Laguna Niguel
Borrego Springs

Perry, Cedric C

From: Ray Cochran <cochran818@gmail.com>
Sent: Monday, October 03, 2011 6:35 PM
To: Perry, Cedric C
Cc: johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us; info@theabf.org
Subject: Ocotillo Wind Project comments

TO: Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

cc: Imperial County Planning Department:

Mr. John Renison
District 1 Supervisor
johnrenison@co.imperial.ca.us

Mr. Jack Terrazas
District 2 Supervisor (DISTRICT INCLUDES OCOTILLO)
jackterrazas@co.imperial.ca.us

Mr. Michael W. Kelley
District 3 Supervisor
michaelkelley@co.imperial.ca.us

Mr. Gary Wyatt
District 4 Supervisor
garywyatt@co.imperial.ca.us

Mr. Ray Castillo
District 5 Supervisor
raycastillo@co.imperial.ca.us

CC:
Mr. Chuck Bennett, President
Mr. Ralph Singer, Vice-President Environmental Affairs
Ms. Diana Lindsay, Trustee
ANZA-BORREGO FOUNDATION
P.O. Box 2001
Borrego Springs, CA 92004

The destructive wind power development slated near Anza-Borrego Desert State Park's southeastern border near Ocotillo. It is urgent that we protect the 12,000 acres of pristine desert habitat that is the Anza-Borrego! The project is adjacent to Anza-Borrego Desert State Park, California's largest state park, designated as part of the world biosphere reserve. This gigantic, ill-conceived project is planned for in an **P158-01** irreplaceable desert habitat. **P158-01, cont.**

The project would:
- Devastate vital habitat for the Endangered Peninsular bighorn sheep, and the flat-tailed horned lizard, a perennial candidate for listing under the Endangered Species Act.
- Add significantly to the cumulative impact on the above species from other energy and agricultural projects in the area.
- Pose a serious threat of injury and death to golden eagles and other raptors known to live in the area, as well as the LeConte's thrasher, burrowing owls, several other sensitive birds species, and as many as twelve species of bats.
- Forever alter the wild character of the southern parts of Anza-Borrego Desert State Park, destroying its recreational qualities.
- Desecrate ancient Native cultural sites in the the Yuha Desert cultural area, and interfere with the work of the soon-to-be-opened Imperial County Desert Museum.
- Turn the town of Ocotillo from a quiet, bucolic desert refuge to an industrial zone full of deafening noise 24 hours a day.
- Illegally alter the landscape surrounding the protected Juan Bautista de Anza National Historic Trail.
- Devastate those parts of Imperial County's economy that depend on tourism in the unspoiled desert

P158-02

The Draft EIR/EIS is deficient because:
- It does not include a "Distributed Generation" alternative
- Public comment was shortchanged due to a truncated "scoping" process

P158-03

Urge THE BLM to:
- Adopt the "no project" alternative
- Extend the public comment period by at least 30 days
- Hold additional public scoping meetings at which public statements would be allowed.

P158-04

I have spent the past 15 years visiting the Dessert Park, and learned a few years ago that it has often been a candidate for becoming a National Park. It deserves just such treatment. It is one of my two favorite natural landscapes and habitats for birds and other species that this nation treasurers. I urge you to re-consider action on this project. It should not go forward.

P158-05

Ray Cochran, Ridgewood, New Jersey
cochran818@Gmail.com

Perry, Cedric C

From: Richard Caputo <richardcaputo@sbcglobal.net>
Sent: Monday, October 03, 2011 9:38 PM
To: Perry, Cedric C; Angelina Havens
Cc: Linda Carson
Subject: Comments on Ocotillo Express Wind Project
Attachments: Ain't Solar Panels on Rooftops All We Need.pdf; ATT00001.htm

Cedric and Angelina,

Here is my input to your request for public comments on this proposed wind project. It takes the form of a note to the Anza-Borrego Foundation.

Dear Anza-Borrego Foundation,

I thank you for your caring for Anza-Borrego and your long term stewardship.

This wind project is also not on A-B park land and yes, it is adjacent to the park. A-B Park is the largest state park in the 49 states and is the gem of the CA system. If you assume that you want to exclude any thing you can see up to 10 miles away from the edge of A-B park, then you have just added 50% to the area of the park. At some point, you have to say enough is enough.Isn't A-B Park really big enough right now.

We need all the wind generation we can build near San Diego. It beautifully balances the solar power we are in the process of building. Together, they tend to balance the 24/7 demands of the people who live in the San Diego region. As you know, roof-top PV is a mid-day power source and generates most of its power between 9am and 3 pm. Do you know anyone who only uses electricity between 9 am and 3 pm?

You recommend to "no-project" option and I must say this is tempting but I think it is a false hope. I would like you to read an Op Ed piece printed in the Union Tribune recently.

P159-01

The No-Project Option for Ocotillo Express Wind Project#
#
We all know that we need to move away from using fossil fuels to power our# society and the sooner the better. Some people point out that putting solar panels# on buildings in San Diego is all the renewable energy we need, and would be# THE major source of our electricity in a sustainable future. They claim that there# are no impacts of this approach since the buildings already exist within the urban# power grid, and there is no need to disturb land that is not already disturbed or to# use additional transmission lines into the city. They also claim that because we# can put up all the rooftop solar that we want, we don't need those other power# sources that use transmission lines such as wind, desert solar, or geothermal# power plants. Certainly seems like an attractive solution to our clean energy# future, but is this claim reasonable? In a word, no! Why? Rooftop solar has two# major impacts; it is massively misaligned with our need for electricity 24/7, and it#

P159-02

P159-02, cont.

is expensive. Also, once energy efficiency efforts cap electricity growth, we have#
all the transmission lines we need.#
#

P159-03

What makes more sense than rooftop solar photovoltaics (PV) alone, is using a#
mix of renewable energy sources that collectively are better matched to the 24/7-#
electricity use in a city such as San Diego. Why is this important? If you don't#
match how the renewables perform over the day and night compared to how we#
use energy over all 24 hours, there will be a mismatch that forces us to rely on#
fossil fuels to do the heavy lifting or we'll have to use excessive amounts of#
expensive electricity storage.#
#

P159-04

Rooftop solar panels is a mid-day power source producing most of its power#
between 9 am and 3 pm. Trying to extend fixed panel PV usefulness beyond midday#
would mean using expensive utility scale electrical storage which more than#
doubles the cost of the energy stored. Midday renewables such as rooftop PV is#
not "the" solution --- however, it is one of the options in the mix to power San#
Diego for the future.#
#

P159-05

A desirable renewable energy mix needs solar plants that run different lengths of#
time to cover day and night. There are five different kinds of renewable plants#
that make up this mixture. First, those that run around the clock are baseload#
plants that operate about 23 hr/day (annual average time of operation at rated#
power), and include geothermal, biogas (from waste water treatment and trash)#
and biomass (from trash) electric plants. Second, there are plants that can run all#
day and into the evening such as the desert solar thermal plants with cheap#
thermal storage of 6 or more hours. They can run more than 10 hr/day at rated#
power. Third, there are wind farms that run during the day and night depending#
on weather and the specific site, and can run at about 9 hr/day. Fourth, there are#
options that track the sun and operate from sunrise to sunset for about 7 hr/day#
at rated power. These tracking desert solar plants could be either PV or solar#
thermal. Finally, fixed panel PV that is a mid-day power source could be located#
in the desert (5 hr/day) or in the city (4 hr/day). Rooftop PV in the city is desirable#
because it is placed on buildings or disturbed land and can reduce some costs#
associated with the electric distribution system. These desirable characteristics of#
rooftop PV compensate for it's being the poorest way to accommodate the 24/7#
demands of San Diego. A mix of all five types of renewables is much better at#
matching the daily profile of the city's energy demand. This mix would minimize#
the use of fossil fuels and expensive electricity storage.#
#

P159-06

Questions are often raised about the use of transmission lines for most of these#
options to move the energy to the city. Energy efficiency programs based on very#
cost effective measures could flatten future electrical energy growth, and we will#
not need any new transmission lines into the city when electricity demand growth#
is halted. San Diego imports over 60% of its energy now on these existing#
transmission lines. As the state mandates that an increasing share of our energy#
comes from renewables (20% in 2010, 33% in 2020 and probably 50% in 2030),#

P159-06, cont.

these new renewables will push fossil energy off these existing transmission# lines. All that will be needed is relatively short lines to connect the renewable# energy sources to these existing lines. Since we have not yet flattened our# electricity energy growth, a new transmission line (Sunrise) is needed in the near# term to start the flow of this desirable mix of renewables. When completed,# Sunrise will raise San Diego's import capability to about 75%. This is enough to# power San Diego with renewable energy to 100% renewables by 2050.#

#

P159-07

Energy cost is also important in renewable electricity decisions. This is in addition# to the grid balancing issues discussed previously. Wind is the cheapest option at# about 7 cents per kWh (kilowatt hour)). For comparison, the average cost of# electricity in San Diego is about 17.5 cents/kWh. The baseload options are next# cheapest with geothermal at 8 cents, bioelectricity at 11 cents. Desert solar with# cheap thermal storage is from 8 to 15 cents. Residential rooftop PV is the most# expensive option and costs about 17 cents with current subsidies (28 without# subsidies). Commercial rooftop PV costs about 8 cents with current subsidies,# and 3rd party and utility PV costs about 15 cents. If all the PV options are# averaged, the resulting cost is about 14 cent and they are the most expensive of# the renewable options. The extra cost for transmission to deliver this electricity is# about 1 cent for a weighted average of old and new transmission costs. (For# comparison purposes, the energy cost is levelized over 20 years so it represents# an average cost in cents/kWh.)#

#

P159-08

What makes the most sense is using a mixture of renewable energy sources that# are better matched to the 24/7-electricity use and to control cost. We can do it!# With a mix, we can have a low cost and a reliable 24/7 renewable electricity# future in San Diego!#

#

Richard Caputo#
Founding Chair of the San Diego Renewable Energy Society www.sdres.org#
Board Member of the American Solar Energy Society www.ases.org#

P.O. Box 1660
Julian, CA 92036
760-765-3157

Ain't Solar Panels on Rooftops All We Need?

We all know that we need to move away from using fossil fuels to power our society and the sooner the better. Some people point out that putting solar panels on buildings in San Diego is all the renewable energy we need, and would be THE major source of our electricity in a sustainable future. They claim that there are no impacts of this approach since the buildings already exist within the urban power grid, and there is no need to disturb land that is not already disturbed or to use additional transmission lines into the city. They also claim that because we can put up all the rooftop solar that we want, we don't need those other power sources that use transmission lines such as wind, desert solar, or geothermal power plants. Certainly seems like an attractive solution to our clean energy future, but is this claim reasonable? In a word, no! Why? Rooftop solar has two major impacts; it is massively misaligned with our need for electricity 24/7, and it is expensive. Also, once energy efficiency efforts cap electricity growth, we have all the transmission lines we need.

What makes more sense than rooftop solar photovoltaics (PV) alone, is using a mix of renewable energy sources that collectively are better matched to the 24/7-electricity use in a city such as San Diego. Why is this important? If you don't match how the renewables perform over the day and night compared to how we use energy over all 24 hours, there will be a mismatch that forces us to rely on fossil fuels to do the heavy lifting or we'll have to use excessive amounts of expensive electricity storage

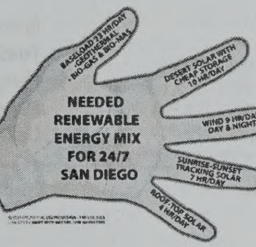
Rooftop solar panels is a mid-day power source producing most of its power between 9 am and 3 pm. Trying to extend fixed panel PV usefulness beyond mid-day would mean using expensive utility scale electrical storage which more than doubles the cost of the energy stored. Midday renewables such as rooftop PV is not "the" solution --- however, it is one of the options in the mix to power San Diego for the future.

A desirable renewable energy mix needs solar plants that run different lengths of time to cover day and night. There are five different kinds of renewable plants that make up this mixture. First, those that run around the clock are baseload plants that operate about 23 hr/day (annual average time of operation at rated power), and include geothermal, biogas (from waste water treatment and trash) and biomass (from trash) electric plants. Second, there are plants that can run all day and into the evening such as the desert solar thermal plants with cheap thermal storage of 6 or more hours. They can run more than 10 hr/day at rated power. Third, there are wind farms that run during the day and night depending on weather and the specific site, and can run at about 9 hr/day. Fourth, there are options that track the sun and operate from sunrise to sunset for about 7 hr/day at rated power. These tracking desert solar plants could be either PV or solar thermal. Finally, fixed panel PV that is a mid-day power source could be located in the desert (5 hr/day) or in the city (4 hr/day). Rooftop PV in the city is desirable because it is placed on buildings or disturbed land and can reduce some costs associated with the electric distribution system. These desirable characteristics of rooftop PV compensate for it's being the poorest way to accommodate the 24/7 demands of San Diego. A mix of all five types of renewables is much better at matching the daily profile of the city's energy demand. This mix would minimize the use of fossil fuels and expensive electricity storage.

Questions are often raised about the use of transmission lines for most of these options to move the energy to the city. Energy efficiency programs based on very cost effective measures could flatten future electrical energy growth, and we will not need any new transmission lines into the city when electricity demand growth is halted. San Diego imports over 60% of its energy now on these existing transmission lines. As the state mandates that an increasing share of our energy comes from renewables (20% in 2010, 33% in 2020 and probably 50% in 2030), these new renewables will push fossil energy off these existing transmission lines. All that will be needed is relatively short lines to connect the renewable energy sources to these existing lines. Since we have not yet flattened our electricity energy growth, a new transmission line (Sunrise) is needed in the near term to start the flow of this desirable mix of renewables. When completed, Sunrise will raise San Diego's import capability to about 75%. This is enough to power San Diego with renewable energy to 100% renewables by 2050.

Energy cost is also important in renewable electricity decisions. This is in addition to the grid balancing issues discussed previously. Wind is the cheapest option at about 7 cents per kWh (kilowatt hour)). For comparison, the average cost of electricity in San Diego is about 17.5 cents/kWh. The baseload options are next cheapest with geothermal at 8 cents, bioelectricity at 11 cents. Desert solar with cheap thermal storage is from 8 to 15 cents. Residential rooftop PV is the most expensive option and costs about 17 cents with current subsidies (28 without subsidies). Commercial rooftop PV costs about 8 cents with current subsidies, and 3rd party and utility PV costs about 15 cents. If all the PV options are averaged, the resulting cost is about 14 cent and they are the most expensive of the renewable options. The extra cost for transmission to deliver this electricity is about 1 cent for a weighted average of old and new transmission costs. (For comparison purposes, the energy cost is levelized over 20 years so it represents an average cost in cents/kWh.)

What makes the most sense is using a mixture of renewable energy sources that are better matched to the 24/7-electricity use and to control cost. We can do it! With a mix, we can have a low cost and a reliable 24/7 renewable electricity future in San Diego!



Richard Caputo
San Diego Renewable Energy Society www.sdres.org
American Solar Energy Society www.ases.org

Comment Letter P160

Perry, Cedric C

From:	Robert Dallezotte <bob@xinutech.com>
Sent:	Tuesday, January 04, 2011 10:05 AM
To:	Perry, Cedric C
Subject:	FW: Concerns/Questions on Ocotillo Wind Express Project
Attachments:	Dallezotte_wind_project_Ocotillo_4_Jan_2011.pdf
Importance:	High

Cedric,

I made a typo on your email, so I am forwarding you the original message.

Thanks,
Robert Dallezotte

From: Robert Dallezotte [mailto:bob@xinutech.com]
Sent: Tuesday, January 04, 2011 10:01 AM
To: caocotillo@blm.gov; cedrick_perry@blm.gov; jackterrazas@co.imperial.ca.gov; angelinahavens@co.imperial.ca.gov; jimminnick@imperialcounty.net
Cc: 'Robert Dallezotte'; renee@xinutech.com
Subject: Concerns/Questions on Ocotillo Wind Express Project
Importance: High

Hi All,

Please review the attached letter in regards to the proposed Ocotillo Wind Express Project. I will not be able to attend the meetings this week, so please accept this letter to be recorded and reviewed.

Please do not hesitate to contact me with any questions.

Thank you,

Robert Dallezotte
PO Box 390
Ocotillo, CA 92259
Cell 619-571-1718
mailto:bob@xinutech.com

Robert Dallezotte

PO Box 390
Ocotillo, CA 92259
Tel. 619.571.1718
Fax 619.448.7755
mailto:bob@xinutech.com

January 4, 2010

To: CA State Rep.: Bob Filner (sending this directly to his email at house.gov)

BLM: caocotillo@blm.gov

cedrick_perry@blm.gov

County Supervisor: jackterrazas@co.imperial.ca.gov

Imperial Planning: angelinahavens@co.imperial.ca.us

jimminnick@imperialcounty.net

Subject: Ocotillo Wind Express Project

To all,

My name is Robert Dallezotte and I have eight parcels in Ocotillo Unit #1 and Unit #2. The total acreage is 135 acres. In 2005/2006 I installed a brand new manufactured house and 2,800 square foot garage on one of lots. I have questions and concerns about this Ocotillo Wind Express Project.

I will not be able to attend the meeting on 5 or 6 January 2011, so I am sending this letter to be recorded and reviewed.

P160-01

- Our residence was specifically situated to highlight the view of the beautiful Coyote Mountains to the North. **The installation of the windmills will significantly affect the value of all our properties.**

P160-02

- I am questioning how safe these windmills are since they are to be installed so close to our properties. **Can the responsible parties guarantee the safety of the citizens of Ocotillo?** I have specific concerns because I own a 70 acre parcel adjacent to the windmill site. The APN number is 033-250-27. I have been reading about health concerns when these windmills are so close.

P160-03

- These windmills will significantly reduce the availability of the off-highway riding in the area and the views of the mountains will be ruined.

P160-04

P160-05

__Proposed solution:__ Do not install the windmills. The town is going to be surrounded by these monstrosities. **If these are to be installed, I request that they are not installed near the town and do not block the beautiful view of the Coyote mountains.**

The proposed location of these windmills will engulf our community and is a slap in the face to the residents of Ocotillo. There is plenty of land out S2 away from the town to put these windmills if they do go forward with this project. I am very unhappy with Jack Terrazas's stance on this issue, as he is supposed to represent our town and is doing nothing to help our community on this issue.

Sincerely,

Robert Dallezotte

Comment Letter P161

Perry, Cedric C

From:	Ron Schuelke <schuelke@sonic.net>
Sent:	Tuesday, October 04, 2011 8:39 AM
To:	Perry, Cedric C
Cc:	Imperial County; dean frazer
Subject:	Ocotillo Express Wind Project

TO: Bureau of Land Management

I am sending this e-mail correspondence to express my opposition to the Ocotillo Express Wind Project.

This opposition is not because I live there. I don't even live close to Ocotillo. However I travel to the Anza Borrego State Park once per year in January. I love going to a place where there is no industrialization. I love the naturaly desert - cactus, wild flowers, and song birds. I have looked for mountain sheep there, but have yet to see one. If this project is approved and constructed it will reduce my chances to see one of those magnificent animals in the future.

That desert region deserves to be preserved in its natural state, which is why it was originally set aside as a state park. I understand that ther are lines on a map to separate the state park from BLM land; but the fact is that when you visit there you can't tell the difference. If this project is completed, there will be an obvious eyesore to identify BLM land, and the BLM should change its name to the Bureau of Land Mis-Management (BLMM).

I urge the BLM to adopt the "no project" option regarding the Ocotillo Express Wind Project.

P161-01

Truthfully and Sincerely,

Ronald W. Schuelke
6421 Timber Springs Ct
Santa Rosa, CA 95409

Perry, Cedric C

From: aloharose@cox.net
Sent: Monday, October 03, 2011 5:40 PM
To: Perry, Cedric C
Cc: angelinahavens@co.imperial.caus; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us; conrad@theabf.org
Subject: Opposition of the Ocotillo Wind Project

Mr. Perry:

Desecration of the natural landscape for a wind project is raping our environment for financial gain for some while generating extra power for those that should be encouraged to use less energy instead. Other alternatives exist, i.e. solar programs. Use your funding to provide solar power generating systems directly to those consuming the power. **P162-01**

The state of Hawaii is considering a similar wind project on the island of Molokai. I own property there. The island of Molokai, like the Anza Borrego Park, are unspoiled, undeveloped and pristine. It's a travesty to desecrate this type of landscape with windmills 400+ feet high. This is not to mention the changes to the wild life and vegetation in the area. I have visited the Anza Borrego Park on several occasions and would hate to see it change. Like the island of Molokai, you can't find this type of natural beauty just anywhere. **P162-02**

Please use careful consideration before proceeding with this project. There is a lot of desert out there. Please move the project away from this pristine park land and Ocotillo Wells. **P162-03**

Lastly, please consider adopting the following:
- The "no project" alternative
- Extend the public comment period by at least 30 days
- Hold additional public scoping meetings at which public statements would be allowed.

P162-04

Respectfully submitted,
Rose Hartman
Dana Point, CA

Perry, Cedric C

From: Sandra Zelasko <slzphoto@sbcglobal.net>
Sent: Tuesday, October 04, 2011 8:31 AM
To: Perry, Cedric C
Subject: Ocotillo Express Wind Project

The Ocotillo Express Wind Project would be devastating to bighorn sheep and other wildlife, significantly impairing wild habitat which this population needs to sustain life. In addition, it poses serious threat of injury and death to golden eagles and other raptors known to live in the area.

Leave the wild in Anza-Borrego Desert State Park. It is why I spend time there. Protect the landscape, ensure the tourism! Extend your comment period by at least 30 more days and hold a few public scoping meetings and listen for yourself.

I adamantly oppose the Ocotillo Express Wind Project for reasons I have stated and many more.

P163-01

Sincerely,

Sandy Zelasko
Sandra Lee Photography
"Education through photography. Discovering nature one image at a time."
15864 Severino Lane
Valley Center, CA 92082
760-749-2174
www.SandraLeePhotography.com
www.printroom.com/pro/sandraleephotography
www.photosourcebook.com/2121

Perry, Cedric C

From: Scott & Emma Smith <mediasite_1999@yahoo.com>
Sent: Tuesday, October 04, 2011 2:19 AM
To: Perry, Cedric C
Cc: angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Subject: Ocotillo Wind farm - Case file: CACA051552
Attachments: Ocotillo Wind farm- SES Objections..doc

Dear Mr. Perry,

Please find attached a letter with my views of, and objections to, this project.

This project will be an eyesore for generations and is a poor example of how to provide stewardship of land to which you are entrusted.

Yours Sincerely,

Scott E. Smith

Tanar House
3 The Priory
Horsley
Glos GL6 0QR
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4 October 2011

Ref: Case File CACA051552

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Mr. Perry,

I write to you in response to proposed development plans by Ocotillo Express LLC for a wind generation plant in the Southwestern corner of Imperial County.

I am presently a UK resident but increasingly spend more and more time exploring the desert regions of Southern California. Specifically, I go to enjoy the flora, fauna and geography of the area and simply marvel at the open space and solitude of the desert regions.

My travels have taken me throughout the Imperial County and while man has made significant impacts on the land, the area in say a 10 mile radius of Superstition Mountain still largely retains the native beauty of the region (if you ignore the used ordinance and bomb sites !). **P164-01**

Certainly developments such as commercial agriculture around El Centro produce valuable tax revenue and the various military reservations (not the least of which is YPG) certainly add to the tax base of the county as well. However, a wind farm in the Southwestern corner of the county above interstate 8 is going to simply forever spoil the visual contrast between the desert floor and the In-Ko-Pahs.

It will be an incredible eyesore and a blight on the landscape.

Just drive the 62 Northeast from the 10 towards Morongo Valley to see what you and the Imperial County Board of Supervisors will have as their legacy for the region. Not something I would be proud of ! It does beg the question however if **P164-02** the county needs the tax revenue that badly why not locate the wind farm below interstate 8 ? **P164-02, cont.**

Don't ask me why, but somehow locating the wind farm south of interstate 8 would not seem nearly as bad. **P164-03**

As to the desert habitat and its native inhabitants, well all I can say is we really do not need further impediments to their survival in this harsh environment and we all know the raptors of the area suffer the most... this is pretty indisputable at this point. **P164-04**

Finally, I think it is a great insult to those individuals, who clearly worked for years, on getting the desert museum open finally. Is this the sort of message you want to send out to visitors to this wonderful area ? **P164-05**

Please say 'No' to this project on behalf of myself, future generations and the native desert inhabitants.

Yours sincerely,

Scott Edward Smith

cc:

Angelina Havens
John Renison
Jack Terrazas
Michael W. Kelley
Gary Wyatt
Ray Castillo

Perry, Cedric C

From: THERESA ACERRO <thacerro@yahoo.com>
Sent: Monday, October 03, 2011 4:23 PM
To: Perry, Cedric C; angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Subject: Ocotillo Wind Farm

The draft EIR is deficient there was an inadequate amount of time for public comment. At the very least there needs to be a distributive generation alternative. This habitat is way to valuable to be turned into an industralized monstrocity. **P165-01**
Please adopt the "No project Alternative, extend the comment period and have more public scoping meetings.
Theresa Acerro, Chula Vista CA

Perry, Cedric C

From: Walter R. Tschinkel <tschinkel@bio.fsu.edu>
Sent: Monday, October 03, 2011 7:01 PM
To: Perry, Cedric C
Subject: Windfarm adjacent to Anza Borrego State Park

Dear Mr Perry,

The proposal to build a wind farm adjacent to Anza Borrego State Park is a truly terrible idea. The damage it would do to the visual landscape, the ecology, the wildlife and the land itself would be enormous and irreversible. The Anza Borrego State Park and the surrounding region is one of the beauty spots of southern California, an area with real wilderness character in many areas and at least desert rural in others. The construction of 155 wind turbines, along with miles of roads and power lines would change this beautiful and precious landscape into an industrial zone. This is completely unacceptable. Let's keep the Anza Borrego Desert as a place of beauty, peace and integrity. **P166-01**

Walter R. Tschinkel
R.O. Lawton Professor
Department of Biological Science
Florida State University
Tallahassee, FL 32306-4370
office 850-644-4489
lab 850-644-9811
FAX 850-644-0481
http://www.bio.fsu.edu/faculty-tschinkel.php

Perry, Cedric C

From:	william taylor <williamwtaylor@sbcglobal.net>
Sent:	Tuesday, October 04, 2011 2:49 PM
To:	Perry, Cedric C; angelinahavens@co.imperial.caus; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Cc:	conrad@theabf.org
Subject:	Ocotillo Express Wind Project

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Angelina Havens

Imperial County Planning Department

Imperial County Board of Supervisors

Dear Sir & Madam:

This is to express my opposition to the above project. I am a lifelong resident of San Diego County, and have been visiting the Anza-Borrego desert area over a span of several decades, to hike, camp, explore and enjoy the incomparably rich natural and recreational resources it offers. The alleged benefits of the project do not warrant the unavoidable impacts identified in the EIS/EIR. In particular, the long-term noise impacts and, most importantly, the long-term visual impacts, would be devastating. The vast, unspoiled vistas off into the distance from the Anza-Borrego State Park are among its greatest resources, and must be protected from affronts such as this project. Please do NOT approve this project. **P167-01**

From: gspdesertdogz@yahoo.com [mailto:gspdesertdogz@yahoo.com]
Sent: Tuesday, October 04, 2011 7:53 PM
To: Kastoll, Valerie A; Blevins, Karissa M; mwest@ca.blm.gov
Subject: elcentro feedback

name = anderw renfrow
organization =
email = gspdesertdogz@yahoo.com
subject = why do you wount to kill the town ofOCOTILLO FeedbackType = General Question
request_comment = would you like to be srouned by wind mill I lived here for 27 years and you are going too kill are TOWN all you care about is your job look at san diego and think of all the water and how mouch bigger can they grouw I live here to get away from the light I enjoy <br>the stars
username123 =
sentinal = Sentinal
page_referred_from = http://www.blm.gov/ca/st/en/fo/elcentro.html
fo = 8
Submit = Send Request

P168-01

Perry, Cedric C

From: Mike Cuff <dez450x@yahoo.com>
Sent: Tuesday, October 04, 2011 9:13 PM
To: Perry, Cedric C
Subject: Ocotillo Wind Express
Attachments: Final EIR EIS comments.doc; Letter to BLM dated 10 January 2011.doc

Mr Perrry

Attached are the letters I have sent in voicing my opposition the the Ocotillo Wind Express Project. Please review them to help you better understand this project.

Michael Cuff
PO Box 36
Ocotillo, Ca 92259
760 336 1514

Comment Letter P169

Bureau of Land Management and the County of Imperial

I don't remember who invited Pattern Energy to Ocotillo to build a wind farm in our back yard but after careful review and close examination I feel as though it is time to tell Pattern Energy, and anyone else that is wanting to exploit the U.S. Government, State of California, County of Imperial and residents of Ocotillo to leave and don't look back. **P169-01**

Pattern has provided misinformation to us at public meetings and in writing. They have obviously influenced the Bureau of Land Management and the County of Imperial to favor this project because my letters to the BLM and County of Imperial were not published in the Draft EIS/EIR. I submitted a document to Cedric Perry, BLM in Moreno Valley in January, voicing my concerns regarding this project. It was 7 pages long and was very specific in questioning the overall effect that this project could have on Ocotillo and all of its inhabitants. The letter did not show up in the Draft EIR/EIS. I called and spoke with Mr. Cedric Perry and asked him why my letter had not been published. He told me that the contractor who was given the letter failed to enter it. I asked him if this was a common procedure and he did not answer me. Is this how our transparent government is responding to the public that is paying their wages that are trying to help by pointing out discrepancies and deficiencies in Patterns Plan of Development? **P169-02**

A few residents of Ocotillo have found that Patterns numbers justifying their project do not add up. Pattern stated in their plan of development that this project would be 5 miles from town. This is incorrect. **P169-03**

Pattern stated that there is sufficient wind to support their project but failed to precisely show us how they came up with their wind calculations stated that the information is proprietary. **P169-04**

Pattern has been unable to justify through scientific study, what the safe and healthy setback distance is for Wind Turbine Generators from an occupied residence. The County of Imperial does not have a safe and healthy setback distance, so Pattern is able to manipulate the distances any way they want in order to get their project approved and receive the federal alternative energy handouts that are worth millions if not billions of tax payer dollars. **P169-05**

Ocotillo will not benefit from this project in any way other than the defacing of our desert, ruining our already deteriorated roads and causing a lot of unneeded commotion for a project that may be unable to provide the energy to enough energy to satisfy the agreement that Pattern has with SDG&E. Pattern has not convinced me or a few others in Ocotillo, that their project will be self sufficient and actually reduce Green House Gas, let alone produce enough electrical energy to pay for their project without not passing additional costs on to the tax payers. Has anyone involved with this project seen justification, based on today's energy requirements, why this project is even needed. **P169-06**

Pattern has failed to justify what the total positive and negative health affects are to humans. **P169-07**

Pattern has failed to ensure that our local fire department has the knowledge, skills, abilities, education, experience and tools to properly combat a fire in a complex wind turbine, that uses extremely toxic materials in its composition. **P169-08**

Pattern has been unable to justify in all confidence, that our property values will not be affected by their project. **P169-09**

Pattern has been unable to justify that our local electrical rates will not be affected by their project. **P169-10**

Pattern has been unable to justify that our cultural resources will not be affected but they have been able to hoodwink the BLM into supporting their project because they haven't verified your claims that everything is in your plan of development is in compliance and has been verified to be accurate. **P169-11**

Pattern has failed to provide a full spectrum noise survey because they know that the BLM and County of Imperial are unaware that their standard does not require additional testing to ensure that noise and vibration below 30 dB's on the "A" scale is not harmful to humans or animals and that the "A" scale may not even be the proper scale to be using. **P169-12**

Pattern has failed to properly notify the Bureau of Land Management, County of Imperial, California Public Utilities Commission, Environmental Protection Agency, Army Corps of Engineers, Department of Defense, Department of Homeland Security and Bureau of Reclamation that their project has not been scientifically proven not to harm anything or anybody. **P169-13**

Pattern has not provided a total disclosure as to their financial stability to include their subsidiaries, associated companies and the others who are supporting this project. **P169-14**

Is Pattern willing to provide complete Cardiological, Neurological, Physiological and Complete Health Physicals for those who live within 5 miles of their project in Ocotillo, to set a base line for continuous monitoring for the life of this project and beyond and provide the necessary treatment to those affected by this project? **P169-15**

Why is it necessary for Pattern to have 2 armed BLM Rangers present at a Town meeting while discussing this project with the folks from town? **P169-16**

Pattern has failed to provide sufficient scientific justification that Electro Magnetic Pulse and Electro Magnetic Frequency from this project will not adversely affect humans and animals in the vicinity of their project. **P169-17**

Pattern has failed to provide scientific justification that blade Shadow Flicker will not adversely affect the residents of Ocotillo and our military air crews flying in the vicinity of this project. Although the Imperial County Airport Land Use Committee agreed with **P169-18** this project, I don't believe that the United States Department of Defense and Department of Homeland Security were fully educated in order to agree with this project. P169-18, cont.

The biologist contractor from Pattern was unable to identify the livable elevation and primary food that the Flat Tailed Horned Lizard (FTHL) consumes in its habitat. It appears that the BLM's biological representative was influenced by the information provided, because it was obvious from previous studies that the FTHL is very particular in its habitat and diet. P169-19

Pattern has not provided sufficient scientific results that the sole source aquifer that provides Ocotillo with water will not be affected. P169-20

Is the BLM and the County of Imperial aware that Pattern has offered my wife and I and 2 others from Ocotillo, an all expense paid trip to visit Ontario, Canada or any of their other projects in order to educate us, or as one neighbor said "Buy Us". P169-21

I have also attached the documents that were sent to the BLM and County of Imperial in January that were not included in the Draft EIR/EIS. P169-22

As previously stated, I want Pattern and this project to leave Ocotillo and not return. I am asking that this project be denied, as it has no justification that it is needed. The project has not been scientifically been proven to be safe and healthy for humans and animals. The County of Imperial Health Department and Planning Department have not been fully educated on the health affects of this project and long term results. P169-23

Michael W. Cuff
PO Box 36
Ocotillo, Ca. 92259

To: Department of the Interior (DOI) 10 January 2011
Bureau of Land Management (BLM)
C/O Cedric Perry
22835 Calle San Juan des Los Lagos
Moreno Valley, Ca. 92553

From: Michael W. Cuff
PO Box 36
134 Via De Coyote
Ocotillo, Ca. 92259

Mr. Perry,

This letter is meant to address the information that was published by Pattern in their Ocotillo Express Wind Facility and their Plan of Development Draft (POD) to be located 5 miles west of Ocotillo, California.

First of all I would like to remind you of the Intent of the California Desert Conservation Area (CDCA) Plan "Is to ensure that as nearly as humanly possible that the recognition brought by Congress and the people into Law- that the California Desert is not a wasteland but a precious public resource – is effectively guaranteed in its management, that the uses of today do not preclude the users of tomorrow, and that we preserve and develop these assets wisely with full regard for their social and environmental as well as economic values". Quoted from the BLM's CDCA, passed by Congress in 1976. **P169-24**

Additionally, "the year 2010 marked the 10th Anniversary of the National Landscape Conservation System. The treasured landscapes of the Conservation System are specially designated and managed to conserve, protect, and restore their exceptional scientific, natural, cultural, ecological, historical, and recreational values" quoted from the front page of the Department of the Interior, Bureau of Land Management California website. **P169-25**

After close study of Patterns draft, I find that they are incorrect or incomplete in their proposal and that the Department of the Interior, Bureau of Land Management would be irresponsible in granting a favorable Record of Decision (ROD) to Pattern for this project in Ocotillo, California. **P169-26**

Let me begin by saying that I have lived in Ocotillo for over 12 years. I am married and my children, ages, 10, 12, and 15 were born here and attend schools in the Imperial Unified School District. We own property and live full time in Ocotillo. I am a retired U.S. Navy Command Master Chief, Disabled Veteran and am currently employed by the Department of Homeland Security, Customs and Border Protection as an Area Safety Specialist, providing Environmental, Health and Safety services to Immigration and Customs Enforcement employees and their facilities in Imperial and San Diego Counties. In my spare time I am an adult leader trainer for Boy Scouts of America and Girl Scouts USA, I am an assistant Scout Master for Troop 4070 and Co-Leader of Girl Scout Troop 7088 in Ocotillo. I am also the San **P169-27**

P169-27, cont.

Diego Boy Scouts of America, San Diego Imperial Council Desert Trails District, District Commissioner. I have enjoyed and recreated in this desert since 1975.

P169-28

According to Pattern's Plan of Development, it is stated on page 1 that they plan on decommissioning the Wind Generation facility 20 years after it has been placed on line for operation or possibly 40 years and that the site would be fully reclaimed.

P169-29

Who will ensure and how will they ensure that our desert is fully reclaimed and restored to its natural condition to include the Desert Pavement and Desert Varnish? How will this be accomplished?

P169-30

How much revenue (In dollars) will the Department of the Interior, Bureau of Land Management receive in granting this project during the course of its operation?

How much revenue (In dollars) will the State of California receive in the granting of this project during the course of its operation?

How much revenue (In dollars) will the County of Imperial receive in the granting of this project during the course of its operation?

How much revenue (In dollars) will the town of Ocotillo receive in the granting of this project during the course of its operation?

P169-31

According to Pattern, they are proposing the Wind Energy Project will be approximately 5 miles west of Ocotillo. I personally used my GPS to measure the distance from the west corner of Imperial Highway (S2) and Opal Street and found that the base of Sugarloaf is 3.0 miles from the center of town, not 5 miles as mentioned in their plan. Five miles from the center of town is located past Sugarloaf by the 2nd trestle on the Carrizo Gorge Railroad maintenance road by the BLM trail marker 160. This is located 2 miles to the west of Sugarloaf. If they were to follow their own approximate measurements they would end up with 36 Wind Turbine Generators (WTG) located within 2 miles of the center of town, 28 WTG located within 3 miles of the center of town, 31 WTG within 4 miles of the center of town and 34 WTG within the center of town. This leaves 64 WTG left to generate the proposed 550 MW. Of these 10 are located in Phase two and may not be included in Patterns project.

P169-32

On page 7 of their plan, Pattern indicates that they would need over 32 million gallons of water that would not be taken from our Federally Protected Sole Source aquifer but trucked in from El Centro Irrigation District. I believe that the Imperial Irrigation District would be the supplier, as there is no El Centro Irrigation District. During a recent scoping meeting that you attended, Pattern mentioned bringing water in by truck from Pine Valley in San Diego County approximately 44 miles one way and that it would take approximately 5900 vehicle trips to provide the water necessary for this project. Imperial County currently does not have the money to repair roads damaged by the Easter Sunday earthquake, how are they going to repair the roads used by 5900 additional vehicle trips on a road that is already in a state of disrepair? Their document indicates they will use the Ocotillo truck bypass road to the east of Ocotillo.

Have they received permission from the private road owner to use this road? How much will Pattern pay to use this road during the course of the project? **P169-32, cont.**

Once Pattern's O&M building is constructed to the north of Sugarloaf within 3 miles from the center of town and within close proximity of the newly constructed US Geological Survey seismic monitoring site for the newly discovered fault to the west of Ocotillo by BLM Trail marker 158. Will Pattern confer with BLM or the USGS regarding the project and its possible effects that it may have on the seismic monitoring in this area? **P169-33**

The black water, gray water, hazardous materials and hazardous waste become an issue due to the Coyote Wells Ground Water basin that is an EPA designated Sole Source Aquifer. Who will be monitoring this site to ensure that Pattern is in compliance with federal, state and local regulations during the duration of the project? How would spills or contamination be remediated? **P169-34**

Currently, the El Centro Field Office does not have its own Environmental, Health and Safety professional. Who from BLM will be monitoring Pattern's project and how often? Who will be the Environmental, Health and Safety professional for Pattern? What is the person's qualification? Who will be BLM's Contracting Officers technical representative (COTR)? Will California EPA be informed of Patterns project and will they be observing the project site during the duration of the project? According to Pattern's Plan they will have a 10' by 14' Oil containment building within the boundary of the O&M yard. What are the specifications of this building and is it approved by DOI/BLM, CA EPA and the County of Imperial? **P169-35**

Currently, Ocotillo has a manned Imperial County Fire Department that is able to respond to most emergency calls. Unfortunately, they do not have the capability of responding with the proper equipment to combat a fire in the Nacelle surrounding the transmission of a WTG. When a WTG catches on fire, the embers from the WTG could travel quite a distance, possibly even to the homes located to the east of the WTG. My house is one of the closest. Are you willing to be liable for my house being destroyed by a fire caused by one of the WTG? Additionally, if one of the blades catches fire then we have a toxicity issue that I'm not sure the fire department has the proper personal protective equipment (ppe) to wear in order to combat this type of fire. **P169-36**

Pattern's POD states that electrical switch gear, junction boxes and other electrical equipment will be used in this project. How are they to contain the dust that is natural to the area, not to mention the dust they create during the construction phases from entering these electrical components during the duration of the project? Once the project is completed there will be vaults and splice boxes above ground that measure 4' x 6' x 4'. How many of these are there going to be? How will they be identified? Will they pose a danger to recreators that will be frequenting the area? **P169-37**

According to Preston Arrowweed, designated spokesman for the Native American Tribes in the area, who was in attendance at the Ocotillo Scoping meeting, BLM has not approached them to inform them of the project. According to BLM's required permit process as stipulated in Federal Land Policy and Management Act of 1976, BLM Planning Regulations (43 CFR Part **P169-38**

1600), BLM Land Use Handbook (H-1601-1) "Indian tribes must be consulted to identify sacred sites and other places of traditional religious and cultural importance", such as Dos Cabezas Camp. When does BLM plan to approach the Native Americans in this area? **P169-38, cont.**

Pattern indicates they will employee up to 300 employees. How many will be from Imperial County, identified as having the highest unemployment ranking in the whole United States? **P169-39**

Pattern indicates on page 18 that they conducted preliminary analysis to describe soil and geological suitability. Who approved the drilling at 6 sites and seismic testing at 18 sites and what were the results? Where can the public observe these results and the approved special permits for Pattern to conduct these tests? Who has the final approval for the foundation design and construction quality control of this project? Are seismic studies for the planned project area in favor of 193 WTG sites with no potential for collapse or failure? What is the material composition of the Nacelle and the turbine blades? What agency provides guidance and approval of the construction materials used for this project, specifically fasters used on high torque equipment and machinery? Which agency will monitor Pattern to ensure that they will use the proper materials for the construction of the WTG to avert what happened on the WTG site across from Golden Acorn Casino by Live Oak Springs in San Diego County, resulting in turbine blade fasteners failing? What is the rated ambient operating temperature of the WTG and its components due to the potential of temperatures reaching over 120 degrees F? **P169-40**

What plans does Pattern have to address the flood plain from the alluvial? **P169-41**

Understanding that the FAA requires lighting for the WTG, I have a concern for pilot and aircrew safety during daylight and night time operations. There is daily air traffic from Customs and Border Protection, as well as US Navy and US Marine aircraft in this area. Additionally, there is occasional illegal aircraft, suspected to be from south of the US Border that could be affected the construction of these WTG. **P169-42**

According to Pattern's Plan of Development, they state "that when the time comes to restore temporary disturbance areas, a BLM approved seed mix will be used". What is the make up of BLM's approved seed mix and where does BLM get these seeds from? Who will oversee the proper distribution of this seed mix when planted to ensure that they are planted properly and will not be disturbed while growing? **P169-43**

On page 25, Pattern states "that during the decommissioning process, they will dig a 10' hole 2/3rds of the way around the foundation of each WTG down to 3 feet below grade" to remove the concrete foundation pedestals. Then place into 10' foot holes. I disagree with their plan. They hauled it in they should haul it out. The aquifer is still there and hopefully it will still be protected. **P169-44**

The area that Pattern is proposing to construct their site is identified by BLM as "Limited Use and borders designated Wilderness". According to BLM's Multiple Use Class Guidelines, Class C for water quality states" these areas will be managed to maintain and enhance both surface and ground-water resources". Limited use indicates, "Areas designated in these classes will be managed to minimize degradation of the water resources. Best management practices, **P169-45** developed by the Bureau during the planning process outlined in the Clean Water Act, Section 208 and subsequently, will be used to avoid degradation and to comply with Executive Order 12088". Who will monitor BLM to ensure that they are in compliance with there own guidelines, given the fact that they found themselves to be not in compliance with their own directives regarding the approval and observance of Special Recreation Permits? **P169-45, cont.**

Who will monitor Pattern's battery bank to provide back up power supply to ensure that they are in compliance with federal, state and local regulations regarding the proper use and storage of electrical storage batteries, that are considered a hazardous material and that contain heavy metals that may affect the aquifer if mishandled? **P169-46**

Additionally, Pattern states that "they will have a standby generator that is fueled by propane or natural gas". Who will ensure that the transportation and storage of these fuels will be in compliance with federal, state and local regulations? **P169-47**

Currently, Pattern has meteorological towers in place for the monitoring of our wind resource. Unfortunately, they are not in the areas identified on the maps given to the public. Who authorized the placement of the towers contrary to their plan? **P169-48**

At Dos Cabezas Camp there are amphibians in small pond that is fed by mountain run off. Has anyone observed and documented these? Will this project have any affect on these amphibians? **P169-49**

The Peninsular Bighorn Sheep travel north and south in the far western area of the project. Some of this area is designated Critical Habitat. What does BLM plan on doing to comply with 50 CFR, Part 17 regarding the protection of the Peninsular Bighorn Sheep? As well as the Flat tailed Horned Lizard and the Bare Foot Banded Gecko? **P169-50**

Have there been any studies conducted on the affects of the WTG lubricating oil on the flora, fauna, birds, mammals, reptiles and plants in the project area? What were the results of these studies? If studies have not been conducted, when will they be conducted and when will the public be able to view the results? **P169-51**

How did BLM determine 5 to 10% of the impacts to wildlife and vegetation would be potentially subject to direct injury or loss? When were the studies conducted and where can the public see the results? **P169-52**

According to page 38 of Pattern's Plan of Development, Potential Impacts to BLM Administered Lands require monitoring 1 to 3 years to acquire the data necessary to characterize the wind regime at a potential wind source area. When did actual monitoring of the wind in this project site actually begin for each monitoring tower? **P169-53**

On page 44 of Pattern's Plan of Development, they indicate that BLM calculates noise impacts from heavy equipment would exceed EPA guidelines and BLM suggests that Residential Ldn noise would be at 55 dB (A) scale for a distance of 1640 feet. What will BLM require of Pattern to comply with the EPA guidelines not to mention OSHA's guidelines found in 29 CFR Part 1910? **P169-54**

Additionally, Pattern indicates that blasting may be required for WTG foundations. How will this affect the newly discovered fault line and USGS and their monitoring sites? How will the residents of Ocotillo be notified of the blasting? Are you aware that Ocotillo has residents that are affected by Post Traumatic Stress Disorder (PTSD)? **P169-55**

Who will be onsite daily to monitor Paleontological Resources at the Pattern project during the course of the project? **P169-56**

BLM has a responsibility to the public regarding Visual Resource Management Designations. Scenic quality and Viewer Sensitivity and the Pattern Project area is considered High Sensitivity according to CDCA. The Viewing Distance Zones in the project area are foreground/middleground and backround zones according to BLM's description, due to there viewing distances of 3 to 5 miles and 5 to 15 miles from the viewing location. There are multiple viewing areas associated with this project. Given the proximity to Interstate 8, County Highway S2 and State Route 98 this project is given a scenic quality classification of C while Viewer Sensitivity is High. The Interim VRM Class rating is III. Who made the final determination that the project areas were rated in this manner? Who monitored their decision to ensure that the decision was made properly using the established guidelines? **P169-57**

I disagree with BLM's decision of the Interim VRM Class rating of III. It should be II according to BLM's objectives, as listed in BLM VRM Visual Resource Inventory Manual. "The objective is to retain the existing character of the landscape. The level of change to the characteristic of the landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape". I cannot picture 193 WTG as not being the dominate view of the casual observer. "Visual changes or modifications that do not harmonize with landscapes often look out of place, and the resulting contrast may be unpleasant and undesirable" quoted from BLM's VRM system.

Page 52 of Pattern's POD indicates Aviation and/or Military considerations, as stated previously; I have a concern for pilot and aircrew safety during daylight and night time operations. There is daily air traffic from Customs and Border Protection, as well as US Navy and US Marine aircraft in this area. Additionally, there occasional illegal aircraft, suspected to be from south of the US border that could be affected the construction of these WTG. Additionally, the private air strip located on the Emory property to the north of S-2 within close proximity of the Imperial County Ocotillo Park may be affected by the location of these WTG. **P169-58**

Also on page 52 of the POD, Geologic resources describe the different soils within the area as well as identifying desert pavement and desert varnish. According to my research, it may take 10,000 years for desert varnish to appear of our desert floor. I do not believe that this project will be able to replace this resource found in the project area. **P169-59**

Page 54 of the POD, talks about Water Resources/Hydrology and the FEMA 100 year flood plain. Their POD states, "that all Turbine sites are located outside the FEMA boundary. This is not accurate. They even elude that "In areas that could be inundated during the 100- year event the turbine foundations will be designed based on the assumption that the water level is at grade, i.e. the buoyancy effects on the concrete will betaken into account. In those areas where the water will be flowing as opposed to ponding, scour protection in the form of rip-rap or a proven alternative method will be provided to prevent undermining of the foundation". I don't find the idea of "Rip Rap or a proven alternative method" acceptable due to the non conformance of BLM's Visual resource management guidelines and other unproven methods regarding his project.

P169-60

How will BLM ensure Pattern will comply with Imperial County's portion of the Salton Sea Air Basin Air Pollution Control District Air Quality and PM-2.5 and PM-10 requirements? Who on the BLM staff from the El Centro Field Office is qualified to monitor this requirement during the duration of this project?

P169-61

Page 62 of Pattern's POD states "one of the primary safety hazards of wind turbines occurs if a rotor blade breaks and parts are thrown off". Will BLM require test data to support the safety of these WTG and their components? Is there any test data to support Pattern's claim of "with proper engineering design and quality control, the blade throw should rarely occur".

P169-62

How will Pattern monitor their transportation plan? Will BLM and the County of Imperial be notified when they commence transport of the equipment and materials required for this project? As previously stated, the County of Imperial does not have the resources for road repair. Has the Imperial School District been contacted by Pattern in regards to traffic flow and proximity to bus routes and bus stops? Will there be independent oversight?

P169-63

Who will conduct Resource Conservation Measure training and ensure the compliance and accountability of Pattern in the areas concerning this project? Who will certify that their archaeological monitors are qualified to support the discovery plan? When will El Centro Field Office be completed with their Wind Energy Protocol? Who ensures that their protocol is in compliance with Federal Regulations, taking in to account state and local regulation concerning Wind Energy and the Wildlife and Monitoring plan that Pattern has referenced?

P169-64

In closing and after considerable thought, I ask you and your staff to give more attention to this Plan of Development and the project that Pattern is requesting. To quote "BLM Management Principles contained in the Federal Land Policy and Management Act (FLPMA) of 1976 recognizes that multiple use, sustained yield, and the maintenance of environmental quality are not simple guides. This act recognized the value of our Nation's public lands and provided a framework in which they could be managed in perpetuity for the benefit of present and future generations. It defined BLM's mission as one of multiple use -- a new concept for the times, but which today stands as your agency's greatest strength.

P169-65

BLM's mission is unique among federal land-managing agencies and you provide us with the best opportunity to meet the many and varied demands of the changing West. In 1976, few anticipated the West's rapid growth and its associated demographic and economic changes, all

P169-66

of which have placed increased demands on the public lands. But because of the insight and vision of the people who crafted it, FLPMA provides us with the tools we need to cooperatively and creatively manage the public lands, and in the process, dispel the notion that a variety of uses and resources cannot co-exist"

Understanding and responding to priority needs of resource use and development, both today and in the future, including such paramount priorities as energy development and transmission without compromising the basic desert resources of soils, air, water, and vegetation, or public values such as wildlife, cultural resources or magnificent desert scenery. I ask you and your staff what this means, in the face of the unknowns, erring on the side of conservation, in order not to risk today what we cannot replace tomorrow".

P169-66, cont.

From: Richard James [mailto:rickjames@e-coustic.com]
Sent: Thursday, October 06, 2011 7:12 PM
To: BLM_CA_Ocotillo_Express_Wind_Project; angelinahavens@co.imperial.ca.us; Meris.Bantilan-Smith@usace.army.mil; jackterrazas@co.imperial.ca.us
Cc: donnatisdale@hughes.net; 'jvolker'
Subject: Comments on Draft EIS/EIR, Ocotillo Wind Case File Number: CACA051552 and Document Number: CA-670-2010-032

To: **Cedric Perry, BLM Project Manager**
California Desert District Office
Angelina Havens, Planner II
Imperial County Planning & Development Services
Jack Terrazas, Chairman
Imperial County Board of Supervisors

US Army Corps of Engineers
Los Angeles District, Regulatory Division,
Attn: SPL-2009-00971-MBS

Please accept the attached Review of the above referenced EIS/EIR for OWEF. This is submitted on behalf of The Protect Our Communities Foundation and Backcountry against Dumps, Inc. whose contact information is provide in the report.

There are extensive references in the review that will be submitted in two parts separate from this email and attachment. The Subject line will be maintained except to add the Part X of 2 notation to make it easier to locate.

If there are any questions please feel free to contact me.

Richard James, INCE

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REVIEW OF NOISE STUDIES AND RELATED MATERIAL REGARDING DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS)/ENVIRONMENTAL IMPACT REPORT (EIR) FOR THE OCOTILLO WIND ENERGY FACILITY (OWEF), IMPERIAL COUNTY, CALIFORNIA

DATE: OCTOBER 5, 2011

Introduction

This review was conducted on behalf of The Protect Our Communities Foundation and Backcountry against Dumps, Inc.[1] as part of their public comments on the BLM EIS/EIR for the proposed Imperial County, Ocotillo Wind Energy Facility, (referred to here as "OWEF" or the "Project"). Additional references are Case File Number: CACA051552 and Document Number: CA-670-2010-032. The focus of this review is on the Draft EIS/EIR Sections relating to noise and its impact on people and wildlife in the region of impact. My work with local communities and citizens groups around the U.S. and Ontario, Canada has focused on the question of how to integrate industrial wind turbines into rural communities. Please see the attached biographic information for my background and experience in wind energy noise and health. In this review I would like to share my understanding of siting criteria for modern industrial scale wind turbines and the impact of the wind turbine noise on people and wildlife.

I have visited sites throughout the Midwest from western Iowa to the coast of Maine, and Ontario to West Virginia where wind turbines were either operating or proposed. I have also reviewed the noise criteria and setbacks proposed by States, Provinces and local government bodies for wind farms. This has given me broad exposure to a number of different situations each with their own requirements. Based on this I find three issues that have a particular importance for my report.

I would like to focus on these points:

First, setbacks, from property lines to the nearest turbine of less than 2 kilometers (1.25 miles) are clearly inadequate for extremely quiet rural communities. The presence of nearby highways will not mask or otherwise offset the noise from wind turbines.[2] Wind turbine noise is distinctively annoying and is not addressed when criteria using dBA weighting and long averaging times are used.[3] [4] [5] The reports and documents submitted on behalf of the Project do not correctly or adequately describe the impact of the proposed project on the host community, or its residents whose homes and properties are close to the footprint of the project. **P170-01** Further, they do not apply the appropriate normalization factors to either the L_{dn} or CNEL land-use compatibility evaluations used by BLM, Imperial County, and the State of California. A separation distance of over one mile may seem **P170-02** extreme but is needed based on the experiences of communities with other wind turbine projects and is alluded to in the EIS/EIR. People living at distances of a mile or more from wind turbines on flat land are experiencing adverse health effects from sleep disturbance at night from audible turbine noise. Other aspects of wind turbine sound emissions, especially amplitude modulated infra and low frequency sounds, even those that may not be reach the threshold of audibility, are currently believed to be caused by disturbances to our organs of balance from the energy in the rapid modulations of the infra and low frequency sound.[6] [7]

---

[1] The Protect Our Communities Foundation, Dennis Trafecanty, President, PO Box 305, Santa Ysabel, CA 92070 and Backcountry Against Dumps, Donna Tisdale, President, P.O. Box 1275, Boulevard, CA 91905

[2] Pedersen, E., van den Berg, F., Why is Wind Turbine Noise poorly masked by road traffic noise?, Inter-noise 2010, Lisbon, Portugal June 13-16, 2010 (invited paper)

[3] Thorne, R, "The Problems with "Noise Numbers" for Wind Farm Noise Assessment," Bulletin of Science, Technology and Society, Pg 262-290, August 2011

[4] Bray, W. James, R., " Dynamic measurements of wind turbine acoustic signals, employing sound quality engineering methods considering the time and frequency sensitivities of human perception," Noise-Con 2011, Portland Oregon. (Invited paper)

[5] It should be noted that all papers published in the Bulletin of Science, Technology and Society are peer reviewed as part of Sage Publications standard policy.

P170-02, cont.

Second, background sound levels submitted on behalf of the Project's developers and/or operators are described as ambient sounds which include the effects of short term events and insects, birds, and 'wind noise'. The selected measurement locations are too close to traffic routes or other local noise sources such that they do not reflect the quiet nature of the rural wilderness community. The measurements used to collect this information do not meet any recognized national or international standard[8]. The end result is a biased assessment of background sound levels that overstates the characteristic soundscape of the community as experienced by the local population and wildlife by as much as 10 to 15 dBA. Use of this data to evaluate the potential for negative impacts of the people living near the project as required in the BLM and CEQA Guidelines leads to a conclusion that the wind turbine noise will not be a source of noise pollution at the homes and properties near the project[9]. Had background noise been properly measured the conclusion would be that the Project will have a significant, continuing impact on the adjacent communities and wilderness areas.

P170-03

The four test locations identified in the EIS/EIR (L1 through L4, Figure 3.10-3) are all located near traffic arteries which will significantly inflate the measured L_{eq} sound levels. The EIS/EIR uses these measurements as the basis for asserting that other areas distant from the traffic routes will have similar high sound levels. Nothing could be further from the truth. Background sound levels in communities of this type are routinely in the mid 30 dBA L_{eq} class during daytime and, at night after traffic and man-made activities begin to drop off, the levels drop to the low 20 dBA Leq range. Had the proper background readings been used for the decision making presented in the EIS/EIR the increase in sound level caused by the wind turbines would be 10 to 20 dBA near residential properties. An increase of this amount will result in the new sounds being considered highly objectionable and likely a source of sleep disturbance. In the wilderness area the sounds will increase by 20 to 30 dBA near or within the footprint of the proposed turbines. As will be shown later, this will have a deleterious impact on wildlife because it will reduce the listening area for mating calls and for predator avoidance.[10]

P170-04

Third, computer model estimates of operational sound levels from the proposed projects understate the impact of the turbines on the community. The computer model estimates do not include confidence limits as is appropriate for any scientific or engineering study (conservatively this would add 3.6 dB to all predicted values and contour lines) nor does the model reflect operation of the

P170-05

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[6] Salt A, Kaltenbach J, "Infrasound from Wind Turbines Could Affect Humans," Bulletin of Science, Technology and Society, Pg 296-302, August 2011

7 Krogh C, Gillis L, Kouwen N, Aramini J, " WindVOiCe, a Self-Reporting Survey: Adverse Health Effects, Industrial Wind Turbines, and the Need for Vigilance Monitoring," Bulletin of Science, Technology and Society, Pg 334-345, August 2011

[8] ANSI-ASA S12.9 Part 2, (R2008) Measurement Of Long-Term, Wide-Area Sound,
ANSI-ASA S12.9 Part 3 (1993 R 2008) Short Term Measurements with Observer Present,
ANSI-ASA_S12.9_Part_1_(R_2003) Quantities and Procedures for Description and Measurement of Env. Sound, and
ANSI-ASA_S12.18-1994_(R2009) Procedures for Outdoor Measurement of SPL.

9 Noise pollution: the emission of sound that unreasonably interferes with the enjoyment of life or with any lawful business or activity.

[10] Barber, J.; Crooks, K.; Fristup, K.; "The costs of chronic noise exposure for terrestrial organisms" Elsevier, Sept. 2009, pgs 180-189

turbines during nighttime during periods of stable atmospheric conditions and other times when in-flow turbulence or high wind shear increase the noise emissions by 6 dBA or more. [11]

P170-05, cont.

P170-06

Had the background studies met the procedural and protocol requirements of the American National Standards Institute's (ANSI) S12.9 and S12.18 standards for measuring the residual background outdoor sounds the study would have reported much lower background sound levels. The Project would have a "significant impact" under the rules of the BLM, Imperial, and CEQA Guidelines (Appendix G). Had the modeling properly addressed the increased sound power emitted by wind turbines from atmospheric conditions, desert topography with ridges to the north, west, and south of the project, high temperature gradients that produce high wind shear and turbulence, and small inter-turbine spacing, the dBA sound levels, L_{dn} and CNEL values predicted for the sensitive receiving locations would have been much higher. These conditions include those of:

- nighttime atmosphere with a stable boundary layer (temperature inversion) and high wind shear above that boundary layer (e. g. high wind shear),
- periods of atmospheric turbulence, as is likely for turbines mounted on high locations with rough terrain, and
- inter-turbine wake-induced turbulence created when turbines are located in rows with inter-turbine spacing of less than 5 to 7 rotor diameters (new information indicates this may need to be more like 10 to 15 rotor diameters)[12] to prevent inter-turbine wake turbulence. Turbines in the current layout are as close as 3 rotor diameters or less.

The BLM/CEQA rules that define when an impact is significant that would not be met if the background noise study, computer modeling, and L_{dn} and CNEL normalization process had been conducted according to the practices identified in this report are:

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

P170-07

Information used in the EIS/EIR provided by representatives of the Project developer and their experts for the Project, on topic of health risks, infra and low frequency noise, noise limits and setbacks, background sounds in rural communities and computer modeling studies are incorrect, incomplete or otherwise misleading. Any implied or stated assertions that there is no research supporting a concern that wind turbine sound emissions at receiving properties and homes or that they cannot result in adverse health effects do not reflect current understanding of independent medical and acoustical research. [13] [14]

P170-08

The combination of the above negative factors in the reports prepared as submittals regarding the Project's wind turbine noise emissions/pollution will result in sleep disturbance for a significant fraction of those who live a mile or more away. Chronic sleep disturbance results in serious health effects. **P170-08, cont.**

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[11] Van den Berg, G.P., "Effects of the wind profile at night on wind turbine sound" Journal of Sound and Vibration, 2003

[12] Calaf, M.; Meneveau. C.; Meyers. J.; "Large eddy simulation study of fully developed wind-turbine array boundary layers," Journal of the American Institute of Physics, 015110-1 to 015110-16, January 25, 2010

[13] Krogh C, Gillis L, Kouwen N, Aramini J, " WindVOiCe, a Self-Reporting Survey: Adverse Health Effects, Industrial Wind Turbines, and the Need for Vigilance Monitoring," Bulletin of Science, Technology and Society, Pg 334-345, August 2011

[14] Krogh, C.; Horner, B.; "A Summary of new evidence: Adverse health effects and industrial wind turbines," Society for Wind Vigilance, www.windvigilance.com, August 2011."

P170-09

For a smaller portion of the community, there will be a risk of the adverse health effects currently described as Wind Turbine Syndrome mediated through the body's organs of balance (vestibular) and proprioception. This is a different set of symptoms and causes than what would be expected of higher levels of infra and low frequency sound and are not related to the audibility of the ILFN. The reports and other documents described in the EIS/EIR on infra and low frequency sound (3.3.5) address adverse health effects that occur when the sound pressure level of the noise source exceeds the Threshold of Perception. The adverse health effects of concern are not related only to those associated with audible levels of infra and low frequency sound. There are also adverse health effects associated with modulated infra and low frequency sounds at levels below the threshold of audibility. Dr. Pierpont's peer-reviewed study reported in "Wind Turbine Syndrome" (published in 2009) is now supported by the work of others, such as, Dr. Alec Salt and his colleagues at the Washington School of Medicine in St. Louis, MO and the Lerner Research Institute/Head and Neck Institute in Cleveland, OH. A reference to one of the peer reviewed papers was provided earlier and others published on this topic are available through on-line Journals.

The result of these technical flaws and an outdated understanding of how the human body responds to acoustical energy below the threshold of audible perception leads to a conclusion that if the Project, as proposed, is approved, it will, with a high degree of certainty, have negative noise health impacts that are "significant." Given that these health effects are first noticed by people with pre-existing medical conditions and that many residents of Ocotillo are retired veterans of the Vietnam War who have such conditions the likelihood that these effects will be more prevalent than in other communities must be considered.

Review

The Draft Environmental Impact Statement provided by the BLM is the subject of this review. I have also had the opportunity to review many similar documents prepared for other wind turbine projects by other acoustical consulting groups that work for the wind turbine project developers.

My experience with industrial wind projects is that wind turbine utilities that appear to meet local requirements in the EIS stage often produce sound levels at the properties and homes of people adjacent or within the Project that lead to complaints one operation commences. Many of these exceed the 40 dBA $L_{(night\text{-}outside)}$ limit set by the World Health Organization (WHO 2009) for safe and healthful sleep. Exceedances of the WHO recommended levels will result in a high level of community complaints of both noise pollution, sleep disturbance, and nuisance. In addition, there is mounting evidence that for the more sensitive members of the community, especially children under six, people with pre-existing medical conditions, particularly those with diseases of the vestibular system and other organs of balance and proprioception, and seniors with existing sleep problems will be likely to experience serious health risks.

The review will address a number of topics. Those topics include:

- Discussion of terms and standards,
- Discussion of weather and its effect on turbines
- Discussion of spacing and its effects on turbine noise
- Limits on noise to protect residential properties and residents:
    - Imperial County sets a CNEL of 60 (Entry in Table 7 for residential, page 21) as the level permitted outside a home. Proper use of this procedure to assess land use

P170-10

compatibility for a new noise source requires that the CNEL be normalized to account for the difference between urban/suburban communities with prior noise exposure (the land use for which CNEL 60 applies) and the nature of the community that will have the new noise source. In this case the host community will be a rural residential community with no prior exposure to noise from the new source. This normalization process was not applied to the predicted CNEL in the report resulting in EIS/EIR tables and conclusions suitable for land use compatibility decisions in urban/suburban communities where industrial sounds are common. But, they are not correct for rural communities with no prior noise experience with a new noise source having impulsive sound characteristics. **P170-10, cont.**

- BLM uses the EPA's 1974 Levels documents recommendation for of 55 L_{dn} as its guide. Proper use of this procedure requires that the L_{dn} be normalized to account for the difference between urban/suburban communities with prior noise exposure (the land use for which CNEL 60 applies) and the nature of the community that will have the new noise source (rural residential with no prior exposure to noise from the new source). This normalization process was also not used in the EIS/EIR. **P170-11**
- BLM noise guidelines (Wind Energy Development, Chapter 4, page 9) also notes that an increase of 10 dB in the background sound level "...almost certainly causes an adverse community response." It also notes that Harris reports a 35 dB Ldn for rural communities. A 35 L_{dn} implies that nighttime sound levels are below 30 dBA. **P170-12**
- The World Health Organization's 2009 Nighttime Noise Guidelines states that levels above 40 dBA (Leq night-outside cause adverse health effects. **P170-13**

- Description of wind turbine noise as a source of environmental noise exposure and noise pollution for humans
- Evidence that the Project noise will exceed the permitted levels,
- Comments on the potential risks to health and welfare of persons living near the footprint of the Project specifically regarding wind turbine noise. A brief discussion on the potential for the noise to adversely impact mating and prey avoidance by wildlife in the footprint of the turbines.

Review of Terms and Standards

L_{Aeq}: The equivalent energy level in dBA. A measure of the acoustic energy over some interval of time that expresses the total energy of time-varying sound as a single number. Leq is very sensitive to short duration high amplitude events. A one hour Leq measurement in a quiet rural area with sound levels of 25 dBA for 59 minutes will have an Leq of 42.3 dBA if, during that hour, a short term noise, such as a vehicle pass-by on a nearby road, raises the sound level to 60 dBA for one minute. Leq is not a good descriptor for the background sound level in a quiet community where there are extremes between the residual sound (all sounds from afar that are not short term) and short term events that have high sound levels.

L_{An}: A statistical value determined by sampling sounds for some period of time, often 10 minutes to an hour, but it could also be longer, constructing a histogram. The L_{A90} would be the sound level representing the quietest 10% of the time. It is traditionally associated with the long term background sound level or residual sound level. The L_{A10} would be the sound level representing the noisiest 10% of the time. It is traditionally used as a descriptor of noisiness. The L_{A50} would be the sound level representing the median of the distribution of sound levels. The L_{A50} is not the same as L_{Aeq}. However, the L_{A50} is less sensitive to short term events and thus is often used to represent an 'average' sound level.

Ambient sound[15]: at a specified time. the all encompassing sound associated with a given environment, being usually a composite of sound from many sources at many directions, near and far, including the specific sound source(s) of interest.

Residual sound: at a specified time, the all-encompassing sound, being usually a composite of sound from many sources from many directions, near and far, remaining at a given position in a given situation when all uniquely identifiable discrete sound sources are eliminated, rendered insignificant, or otherwise not included. Specified in S12.9, Part 1 the residual sound may be approximated by measuring the percentile sound level exceeded during 90 to95 percent of the measurement period (e.g. L_{A90}).

Background sound: all-encompassing sound associated with a given environment without the contributions from the source or sources of interest. In S12.9, Part 3, background sound is described as a combination of (one) Long-term background sound, and (two) short-term background sounds, with the durations for long and short defined according to application and situation.

Long-term background sound: background sound measured during a measurement, after excluding the contribution of short-term background sounds in accordance with one of the methods specified in the standard S12.9, Part 3. Long-term background sound is assumed to be approximately stationary in a statistical sense[16], over the measurement duration, and it is describe solely by its sound exposure per unit time (in each frequency-weighted or frequency-filtered band of interest).

Short-term background sound: background sound associated with one or more sound events which occur infrequently during the basic measurement period, the measurement interval with or without the source operating, and measured in accordance with one of the methods in the standard S12.9, Part 3.

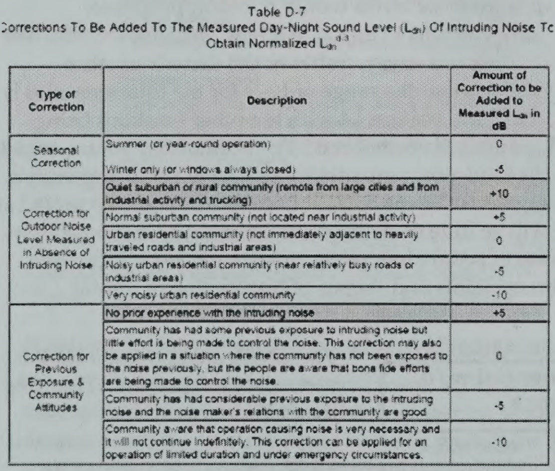

Table D-7

Corrections To Be Added To The Measured Day-Night Sound Level (L_{dn}) Of Intruding Noise To Obtain Normalized $L_{dn}$$^{d.3}$

Type of Correction	Description	Amount of Correction to be Added to Measured L_{dn} in dB
Seasonal Correction	Summer (or year-round operation)	0
	Winter only (or windows always closed)	-5
Correction for Outdoor Noise Level Measured in Absence of Intruding Noise	Quiet suburban or rural community (remote from large cities and from industrial activity and trucking)	+10
	Normal suburban community (not located near industrial activity)	+5
	Urban residential community (not immediately adjacent to heavily traveled roads and industrial areas)	0
	Noisy urban residential community (near relatively busy roads or industrial areas)	-5
	Very noisy urban residential community	-10
Correction for Previous Exposure & Community Attitudes	No prior experience with the intruding noise	+5
	Community has had some previous exposure to intruding noise but little effort is being made to control the noise. This correction may also be applied in a situation where the community has not been exposed to the noise previously, but the people are aware that bona fide efforts are being made to control the noise.	0
	Community has had considerable previous exposure to the intruding noise and the noise maker's relations with the community are good	-5
	Community aware that operation causing noise is very necessary and it will not continue indefinitely. This correction can be applied for an operation of limited duration and under emergency circumstances.	-10

Figure 1- Table D-7 from EPA Levels Document (1974)

Note: Examples of short-term background sounds include sounds from such sources as: a nearby barking dog, accelerating motor vehicle, radio music siren and aircraft flyover, wind, insects, birds, etc.

Standards Used in Assessing Land-Use Compatibility

EPA Levels Document (1974): In the 1970's the EPA operated an Office of Noise Abatement and Control (ONAC) that was tasked with promulgating standards for communities and other non-occupational environments. In 1974, the EPA published the 'Levels" document which provided a resource for communities that were developing local or state level noise ordinances. This work was primarily focused on the needs of urban and sub-urban communities with existing noise exposure. The body of the document presents information for this target audience. For communities with different soundscapes, such as rural communities the tables and graphs presented in the body of the document were not appropriate.

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[15] Reference standards are S12.9 parts 1 and 3 for these definitions.

[16] Seasonal and weather related sounds such as insects, birds, wind rustle in dry leaves, should also be considered short term sounds for the purpose of measuring the long term background sound level. In addition, the test instruments shall not be located near roads, poles, fences, trees, walls or other reflecting surfaces or sources of local noise not representative of the larger community. This also includes streams and locations near roads.

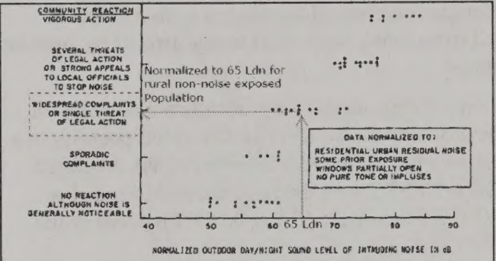


Figure D-7. Community Reaction to Intensive Noises of Many Types as a Function of the Normalized Outdoor Day Night Sound Level of the Intruding Noise [D-3]

Figure 1- Figure D-7 from EPA Levels Document (1974)

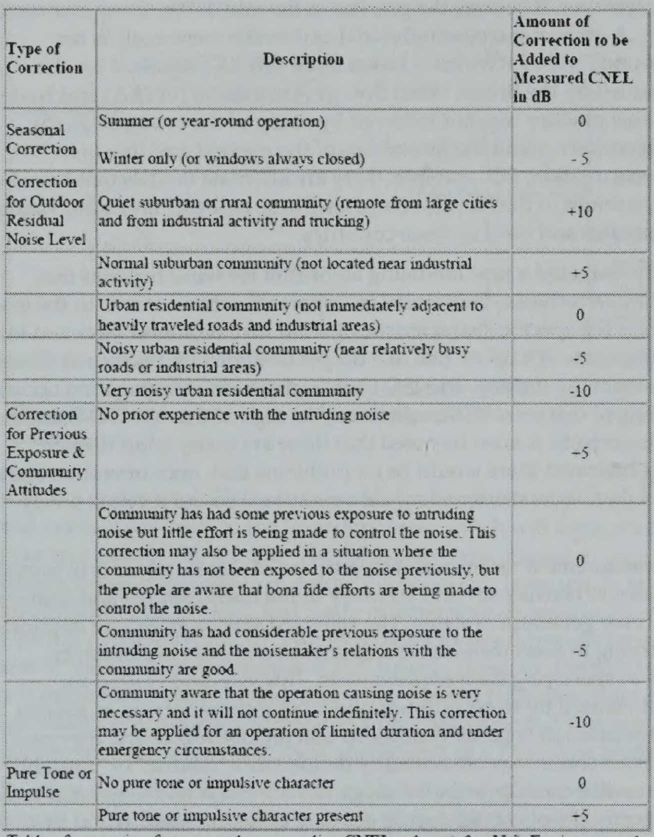
The Levels document included an Appendix that provided the method to be used when adjusting the L_{dn} levels for a proposed project in a rural community to account for differences from the urban/suburban ones for which the 55 L_{dn} applied. Table-7 in the Figure 1 shows the adjustment factors that are to be added to predicted levels for the new noise source's L_{dn} to normalize the data to the equivalent annoyance level for a rural community. For example, an urban or suburban community with prior experience with noise might find sound levels of 55 L_{dn} to be satisfactory. An L_{dn} of 65 dB on the other hand will lead to widespread complaints (see red arrows on Figure D-7).

For a rural community with no prior noise exposure these levels would not be appropriate. Applying the +10 dB normalizing factor to Figure-7 results in an L_{dn} of 65 dB. Because Ocotillo has no prior experience with wind turbine noise (as opposed to say, traffic noise) there is another correction factor of +5. The EIS in Table 4.9-3 reports that the range of L_{dn}'s for the four scenarios is from 45.8 to 49.5 L_{dn} at Location L1 and 39.9 to 44.2 at Location L4 with the other locations being between these two bounds. However these L_{dn}'s are not normalized. The normalized values, which must be used for this method to work, show the land-use compatibility impact is 15 dB higher that the tables report. Thus, the normalized L_{dn} range is 60.8 to 64.5 L_{dn} at Location L1 and 54.9 to 59.2 at Location L4. The reported L_{dn}'s imply there will be little or no negative community response from an urban/suburban population with prior noise exposure but, the normalized levels indicate the wind turbine noise will result in widespread complaints and threats of legal action in a rural community. **P170-14**

Normalized L_{dn}/CNEL For Rural Residential w/o prior noise exposure experience		
Location	**Scenario 1**	**Scenario 4**
L1	60.8/65.8	64.5/69.5
L4	54.9/59.9	59.4/64.4
BLM/Imperial limits for L_{dn} and CNEL to maintain equivalent levels of annoyance to experienced urban/suburban community	55 L_{dn}/60 CNEL	

The CNEL method has a similar normalization process. The table for CNEL normalization (next page) adds an extra correction of +5 dB for sounds that may be impulsive or produces tones. The Table of Normalized Ldn/CNEL for Rural Residential (left) shows that once the EIS/EIR sound levels are normalized the project is at or above the recommended guidelines at all locations. **P170-15**

CNEL Calculation and Normalization Methods Page 1



Type of Correction	Description	Amount of Correction to be Added to Measured CNEL in dB
Seasonal Correction	Summer (or year-round operation)	0
	Winter only (or windows always closed)	- 5
Correction for Outdoor Residual Noise Level	Quiet suburban or rural community (remote from large cities and from industrial activity and trucking)	+10
	Normal suburban community (not located near industrial activity)	+5
	Urban residential community (not immediately adjacent to heavily traveled roads and industrial areas)	0
	Noisy urban residential community (near relatively busy roads or industrial areas)	-5
	Very noisy urban residential community	-10
Correction for Previous Exposure & Community Attitudes	No prior experience with the intruding noise	+5
	Community has had some previous exposure to intruding noise but little effort is being made to control the noise. This correction may also be applied in a situation where the community has not been exposed to the noise previously, but the people are aware that bona fide efforts are being made to control the noise.	0
	Community has had considerable previous exposure to the intruding noise and the noisemaker's relations with the community are good.	-5
	Community aware that the operation causing noise is very necessary and it will not continue indefinitely. This correction may be applied for an operation of limited duration and under emergency circumstances.	-10
Pure Tone or Impulse	No pure tone or impulsive character	0
	Pure tone or impulsive character present	+5

Table of correction factors used to normalize CNEL values (after U.S. Environmental Protection Agency document NTID300.3, *Community Noise*, 1971).

Figure 2 Table of CNEL Normalization adjustments

ANSI S12.9 Part 4 (R_2005): Noise Assessment and Prediction of Long-term Community Response

In 1980 the ONAC was defunded by the administration and has remained unfunded since that time. To cover the loss of the EPA the Acoustical Society of America (ASA) and the American National Institute (ANSI) promulgated a standard that incorporated the same basic concepts as the EPA Levels document and the normalizing process of Table and Figure D-7. This standard can be applied to assess a community's response to a new noise source. It will result in the same recommendations for a rural community as the EPA document. For a non-noise exposed rural community ANSI S12.9 Part 4 sets the nighttime sound level at 30 dBA (Leq) and the daytime to 40 dBA (Leq). **P170-16**

Standards for Computer Modeling of Sound Propagation

ISO 9613-2: Acoustics-Attenuation of Sound during propagation outdoors, Part 2: General Method of Calculation: This standard specifies engineering methods for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of noise sources. The method is applicable, in practice, to a great variety of noise sources environments. It is applicable, directly or indirectly, to most situations concerning road or rail traffic, industrial noise sources, construction activities, and many other ground based noise sources. It does not apply to sound from aircraft in flight, or to blast waves from mining, military, or similar operations. It is validated only for noise sources that are located close to the ground (approximately 30 m difference between the source and receiver height). It is also limited to noise sources that are within 1000 m of the receiving location. Meteorological conditions are limited to wind speeds of approximately 1 m/s and 5 m/s when measured at a height of 3 m to 11 m above the ground. When all constraints, including these, are met by the situation being modeled the procedure is accurate **P170-17**

within a +/- 3 dB range. Its use has not been validated by any independent peer-reviewed process for use in siting wind turbines. However, it became the practice in the mid-1990s to use commercial software packages for modeling. A general-purpose industrial and traffic noise such as the commercial software package SoundPLAN 7.0 which is based upon this ISO standard for thei EIS/EIR. This practice was promoted by the British Wind Energy Association (BWEA) and trade associations in other countries. This practice was not followed by many of the countries in the European Union because of their concern about the limitations of the method and its use for predicting wind turbine sound propagation. For example, there are alternate models that have been developed specifically for wind turbines in the Nordic countries. These models, have been validated by peer-reviewed independent studies and used in those countries.

The Swedish EPA has recently investigated a new modeling algorithm for wind turbines that applies both for onshore and offshore turbines. This model incorporates enhancements to the iso-9613 part 2 algorithms that address the specific characteristic of wind turbine sound infra and low frequency sound emissions to propagate at a decay rate of 3 dB per doubling of distance at distances of several hundred meters away from the turbine. The ISO-Standard assumes propagation occurs at the decay rate of 6 dB per doubling of distance. Although it may be argued that the ISO-Standard is commonly used for wind turbine projects, it must be noted that there are many wind turbine projects where the initial models indicated there would be no problems that, once operation started, exhibit problems. Use of a model that understates real-world operational sound levels is a very likely cause of this problem.

P170-17, cont.

IEC 61400-Part 11: acoustic noise measurement techniques: The purpose of this standard is to provide a uniform methodology that will ensure consistency and accuracy in the measurement and analysis of acoustical emissions by wind turbine generator systems. The standard was prepared for application to wind turbine manufacturers trying to meet well-defined acoustical emission performance requirements, and the purchaser in specifying such requirements. This standard is used to determine the sound power level emitted by wind turbines under conditions defined as normal operation. Normal operation is specified as weather conditions that are not severe and represent operation with low wind shear. Such conditions are normally defined as a "neutral" or "unstable" atmosphere where the windshear will generally be in the range of 0.15 or less and in general under 0.20. This weather condition is commonly observed during daytime of warm seasons and in particular can be described as a warm sunny afternoon in the temperate zone. Under low wind shear conditions the wind speed does not increase significantly between the height where the blade is lowest in this rotation and the top where it is at its highest peak. This allows the anemometer located on the turbine's hub to calculate the optimum angle of attack of the blades and RPM of the hub for maximum efficiency in extracting energy. Because inefficiency in extracting energy results in increased noise, heat, turbulence, and additional stresses on the blades the lowest noise immission condition for wind turbine occurs is when it is most efficiently extracting energy from the wind. In a paper by William Palmer, P.ENG., the effect of varying wind shears on wind turbine noise is explored[17]. Figure 3 shows an example of the optimal weather conditions for a windshear of 0.14 with no stability layer (temperature inversion boundary). The IEC test uses this weather condition to measure the sound power levels emitted by the turbines. The EIS/EIR used that data for its model. The problematic situation is when there is high-level windshear, such as 0.44, without a stable boundary layer. Because there will be a significant difference in the wind speed at the bottom and at the top of the blades rotation path the windshear of 0.44 will be more difficult for the turbine to find the optimum operating mode then for the 0.14 windshear. The low wind shear condition follows a logarithmic relationship described as the Power Law which permits the estimation of a wind speed at some arbitrary height such as the hub from the wind speed at a lower height such as a 10 m meteorological tower. The higher wind shear conditions are much more complex and depend on the height of the stable boundary layer.

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[17] Palmer, W. P,Eng, "A new explanation for Wind Turbine Whoosh, Wind Shear," Third International Meeting on Wind Turbine Noise, Aalborg, Denmark, June 2009.

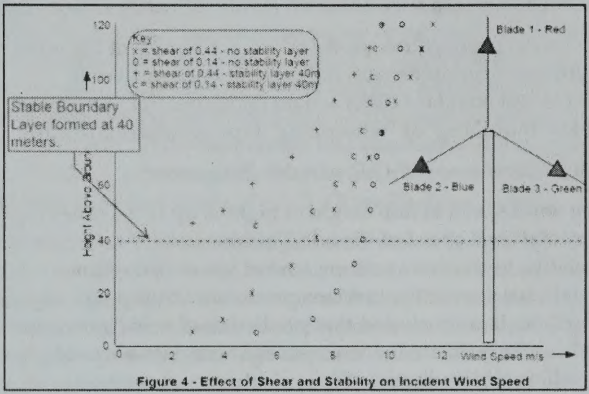

Figure 4 - Effect of Shear and Stability on Incident Wind Speed

Figure 3- Example of wind shear in neutral and stable atmospheres

At night, after the sun's heating of the ground stops, the ground cools. The convection currents present in the daytime that cause the warmed air next the ground to rise upwards mixing with the upper level winds in a smooth gradient also stop. A cool layer of air forms at the ground and extends upwards to the boundary layer which will form at altitudes often between 20 m to 100 m or more above the ground. This boundary layer causes a complete disconnect between the wind speeds below it and above it. Below the boundary layer winds are often calm or even still. There is insufficient wind to cause leaf rustle or other sounds associated with surface level winds. Figure 3 which is extracted from Mr. Palmer's paper shows the stable boundary at 40 m by stopping the "+" and "c" markers for windshear at that height. These are the two curves on the left side of the figure. It is important to understand, that when a stable boundary layer forms the winds above the boundary layer are often moving at a very high rate and that rate increases rapidly with height. It is not uncommon to see wind shear coefficients of 0.7 to 1.0 or higher when these conditions form.

P170-18, cont.

To compound the situation, if the stable boundary layer forms at an elevation higher than the bottom of the blades rotation path the blade will descend into it. Under these conditions the turbine blades which are under wind load above the stable boundary layer lose that load when they enter the still air below the boundary layer. This is situation that the turbine operating system which depends upon hub level anemometers cannot detect nor can it adjust the blades to account for this change. Is this condition that Mr. Palmer believes produces the maximum sound power from the turbine blades and is responsible for the deep blade whoosh that is the source of complaints during nighttime. Measurements of turbines operating this condition have shown blade whoosh (amplitude modulation) of 8 to 15 dBA above the normal sound levels. For the situation of high wind shear without the stable boundary layer blade whoosh (amplitude modulation) normally ranges from 5 to 8 dBA.

This phenomenon has also been studied by Dr. Fritz van den Berg for his graduate thesis titled: "The Sounds of High Winds. In "The Sounds of High Winds " Dr. van den Berg presents a method for determining the increased sound power emitted by wind turbines for various mismatches between the optimum angles of attack for the blades and what occurs when the blades are not at the optimum angle due to high wind shear. He shows that increases of 10 dB can be expected for angle mismatches of 9° or more. Even slight mismatches of 4 to 7° can increase sound power by 3 to 8 dBA.

To further complicate the assessment of a wind turbines sound power under real world situations the atmospheric condition of a stable atmosphere is a very common feature of warm season nights.

The Sound Power data (L_w)used in the sound propagation models does not represent the noise produced by wind turbines during nighttime operations with high wind shear and stable atmospheric conditions. The IEC 61400.11 test standard collects data under neutral atmospheric conditions that do not cause these louder "thumping" or "whooshing" type of noise emissions.

In "*Effects of the wind profile at night on wind turbine sound*" G.P. van den Berg states:

> "....measurements show that the wind speed at hub height at night is up to 2.6 times higher than expected, causing a higher rotational speed of the wind turbines and consequentially up to 15 dB higher sound levels, relative to the same reference wind speed in daytime. Moreover, especially at high rotational speeds the turbines produce a 'thumping', impulsive sound, increasing annoyance further. It is concluded that prediction of noise immission at night from (tall) wind turbines is underestimated when measurement data are used (implicitly) assuming a wind profile valid in daytime."[18]

The "thumping" referred to in the Van den Berg paper occurs in synchronization with blade rotation (about one "thump" or "whoosh" per second assuming the hub is rotating at 20 rpm). "Thumping" does not referring to the blade "swish" of 1-3 dBA present when the turbine is operating in a neutral atmosphere. This "swish" is included as part of the wind turbine sound power ratings provided by the manufacturer. The "thumping" of concern is the much louder noise that is not accounted for in the manufacturer's test data. This occurs typically at night under a stable atmosphere where there is high wind shear. This "thumping" can modulate by 5 to 10 dBA or more and is a result of increased sound power emissions from the wind turbine's blades.

P170-18, cont.

Based on this reviewer's experience the nighttime noise is increased by at least 5 dBA over what is observed for similar hub level wind speeds during the day under a neutral atmosphere and the noise takes on an impulsive character due to the blade swish/thump. If the increased sound power caused by the nighttime atmospheric conditions had been added to the manufacturer's sound power for neutral atmospheric conditions the predicted values in the EIS/EIR would be 5 dBA or more higher than what is shown in the report tables and contour map.

In temperate zone climates it can occur as often as 60% of summer evenings. In a desert environment, where the solar heating and nighttime cooling can be even more extreme a stable atmosphere may be even more common. Since the IEC 61400 - 11 measurement procedure only provides information for the sound power under the neutral atmosphere and low windshear use of the data from that standard will consistently under predict the sound levels of wind turbines during these, nighttime conditions. This affects the predicted sound levels in the EIS/EIR. If the model is to represent the predictable worst case situation then, at minimum, 5 dB would need to be added to all predicted sound levels.

This review identified another significant deficiency in the computer model. The model fails to disclose and include the tolerances (confidence limits) for instrumentation error of the IEC 61400-11 test procedures of ± 2 dB and also did not include the tolerances for the ISO 9613-2 modeling procedure of ± 3 dB. If the model had included proper adjustments for the confidence limits the results shown on the contour maps and tables of their report would be 3.6 dB higher than stated[19].

P170-19

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[18] Van den Berg, G.P., "Effects of the wind profile at night on wind turbine sound" Journal of Sound and Vibration, 2003

[19] sqrt(3^2 + 2^2)=3.6

The sound propagation modeling software used for the sound models is a general purpose model designed for modeling noise from common urban noise sources like industrial plants, roads, and railways. The ISO Standard limits use of its methods to noise sources that are no more than 30 meters above the receiving locations. A wind turbine with a hub height of 80 meters exceeds this ISO limitation by 50 meters. The EIS/EIR report did not disclose this limitation or make any effort to account for the errors that may accrue from the noise source exceeding the source height limits. SoundPLAN 7.0 is based on the ISO standard and thus limitations to the standard apply equally to the EIS/EIR model results. The deviations from the assumptions of the ISO standard mean that the stated confidence limits of +/- 3 dB are likely exceeded.

P170-20

The result of these two failings, (understated L_w and not including known tolerances) is that the reported EIS/EIR model results are likely 8 dB or more lower (3.6 dB for confidence limits and another 5 for high wind shear conditions) than what will occur on a predictable worst case night. The model does not address the types of audible noise from wind turbines that occur during nighttime periods after high daytime solar heating. The effects the night time wind speed profile on noise emissions also results in impulsive sound which people find most objectionable. This increase would have expanded the boundary of the 40 dBA threshold to include many of the homes around the perimeter of the Project even for the most conservative scenario.

P170-21

Properly modeled and normalized, this project would not comply with Imperial County's 60 dB CNEL limit at sensitive receiving properties. If the additional issues of confidence limits and higher noise was included with the normalization process the predicted Ldn/CNEL levels exceed both BLM and Imperial County criteria.

P170-22

Infra and Low Frequency Sounds and their Impact on People

Both the Imperial County and BLM noise guidelines/criteria focus on audible sound and rely on A-weighted sound levels for decision making. However, wind turbine noise emissions are heavily weighted to the infra and low frequency end of the acoustic spectrum. The level of annoyance produced by wind turbine noise also increases substantially for low frequency sound, once it exceeds a person's threshold of perception. There are also more ways the sound can be perceived than just as audible sound. Perception mediated by the vestibular organs does not involve 'hearing' the sound. (see Salt, Pierpont and others) For audible sounds in the infra and low frequency range the annoyance and the sense of loudness increases more rapidly than the more readily audible mid-frequency sounds. Sound measured as dBA is biased toward 1,000 Hz, the center of the most audible frequency range of sound pressure. Low frequency sound is in the range below 200 Hz and is more appropriately measured as dBC for low frequency sound or in dBG for infrasound. As a result use of dBA criteria misses an important aspect of wind turbine noise.

Because infra and low frequency sounds from wind turbines include significant dynamic modulation in the frequency range from the blade passage frequency of from 1 Hz or less, up to about 10 Hz, standard acoustical instruments such as 1/3 octave band analyzers and FFT analyzers using band filtering cannot be used to measure the short duration pulsations. This is covered in detail in the Bray/James paper. Instrumentation with 1/3 octave band resolution of the spectrum sound pressure levels can only be used for assessing relatively long periods of the infrasound (minutes or hours, not seconds or milliseconds), and even then, the readings may understate the total acoustic energy and the maximum sound pressure levels during those pulsations[20].

Sound below 20 Hz, is generally presumed to not be audible. However, when considering the most sensitive people, the thresholds drop approximately 6-12 dB. Further, the Thresholds of Perception are for a single, steady, pure tone under laboratory conditions. Wind turbine sounds are a complex mix of tones, all within the same critical band. It is possible that for many people they will be audible at levels lower than what is required for a single, steady, pure tone.

The combination of people with extra sensitivity and the presence of a complex set of tones in the range from 0 to 20 Hz puts the infrasound sound pressure levels measured on receiving properties and inside homes within the threshold of perception for a subset of the population. Claims that wind turbine infra sound is "not significant" because it does not reach the amplitudes needed to exceed the Thresholds of Perception are mischaracterizing the situation. The truth is we only know the Thresholds of Perception for single steady pure tones. When the sounds are more complex, as for wind turbines with their multiple combinations of tones and tone fragments with varying types of amplitude and frequency modulation, we do not know the Threshold of Perception. All we know is that it will be lower than for a single steady pure tone. **P170-23**

For many years it has been presumed that only infra and low frequency sounds that reached the threshold of audibility for people posed any health risks. Many acoustical engineers were taught that if you cannot hear a sound, it cannot harm you. Recent research has shown that the human body and auditory system is more sensitive to infra and low frequency noise (ILFN) than previously believed. This perception is not one that is 'heard' but rather it is one that involves the organs of balance (vestibular systems). The vestibular portion of our auditory system can respond to levels of infra and low frequency sound at pressures significantly lower (as much as 40 dB) than what is needed to reach the thresholds of audibility.[21]

Dr. Nina Pierpont has conducted a study of the effects of infra and low frequency sound on the organs of balance that establishes the causal link between wind turbine ILFN and medical pathologies. This research is discounted by the wind industry as not meeting standards for epidemiology and that it is not 'peer-reviewed.' Neither accusation is correct. The type of epidemiological study conducted by Dr. Pierpont is termed a case-crossover study. Dr. Carl Philips, a highly respected epidemiologist not associated with the wind industry has said: [22]

> *"In particular, my scientific analysis is based on the following points, which are expanded upon below:*
>
> *"1. Health effects from the turbine noise are biologically plausible based on what is known of the physics and from other exposures.*
>
> *"2. There is substantial evidence that suggests that some people exposed to wind turbines are suffering psychological distress and related harm from their exposure. These outcomes warrant the label "health effects" or "disease" by most accepted definitions, though arguments about this are merely a matter of semantics and cannot change the degree of harm suffered.*
>
> *"3. The various attempts to dismiss the evidence that supports point 2 appears to be based on a combination of misunderstanding of epidemiologic science and semantic games. Multiple*

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[20] A paper co-written by this reviewer and Wade Bray of Head Acoustics which presented the findings of an analysis of wind turbine low and infrasonic sound that shows these micro-time pulsations are present at levels that exceed the threshold of audibility for steady pure tones and also by the vestibular process identified by Salt et. al.. These papers were referenced earlier in this review.

[21] Salt et. al.

[22] Philips, Carl v., " An Analysis of the Epidemiology and Related Evidence on the Health Effects of Wind Turbines on Local Residents," for Public Service Commission of Wisconsin docket no. 1-AC-231, Wind Siting Rules, July 2010.

> *components of this point appear below. "* *Also,*
>
> *"There is ample scientific evidence to conclude that wind turbines cause serious health problems for some people living nearby."* *And,*
>
> *"The reports that claim that there is no evidence of health effects are based on a very simplistic understanding of epidemiology and self-serving definitions of what does not count as evidence. Though those reports probably seem convincing prima facie, they do not represent proper scientific reasoning, and in some cases the conclusions of those reports do not even match their own analysis."*

This report was peer-reviewed by some of the top experts in the U.S. and Britain who have experience with vestibular disturbances and adverse health conditions. These reviews were included in the published final report. The criticisms leveled at Dr. Pierpont's work by supporters of wind power utilities are not supported by the facts.

The new research is not from the traditional fields that have provided guidance for acoustical engineers and others when assessing compatibility of new noise sources and existing communities. Instead it comes from the field of research into auditory and vestibular function. A recent peer reviewed paper by NIDCD/NIH researcher Dr. Alec Salt, reported that the cochlea responds to infrasound at levels 40 dB below the threshold of audibility.[23] These studies show how the body responds to extremely low levels of energy not as an auditory response, but instead as a vestibular response.

In a personal communication, this reviewer asked Dr. Salt the question: "Does infrasound from wind turbines affect the inner ear?" Dr. Salt responded:

> "There is controversy whether prolonged exposure to the sounds generated by wind turbines adversely affects human health. The un-weighted spectrum of wind turbine noise slowly rises with decreasing frequency, with greatest output in the 1-2 Hz range. As human hearing is insensitive to infrasound (needing over 120 dB SPL to detect 2 Hz) it is claimed that infrasound generated by wind turbines is below threshold and therefore cannot affect people. The inner hair cells (IHC) of the cochlea, through which hearing is mediated, are velocity-sensitive and insensitive to low frequency sounds. The outer hair cells (OHC), in contrast, are displacement-sensitive and respond to infrasonic frequencies at levels up to 40 dB below those that are heard."
>
> "A review found the G-weighted noise levels generated by wind turbines with upwind rotors to be approximately 70 dBG. This is substantially below the threshold for hearing infrasound which is 95 dB G but is above the calculated level for OHC stimulation of 60 dB G. This suggests that most wind turbines will be producing an unheard stimulation of OHC. Whether this is conveyed to the brain by type II afferent fibers or influences other aspects of sound perception is not known. Listeners find the so-called amplitude modulation of higher frequency sounds (described as blade "swish" or "thump") highly annoying. This could represent either a modulation of audible sounds (as detected by a sound level meter) or a biological modulation caused by variation of OHC gain as operating point is biased by the infrasound. Cochlear responses to infrasound also depend on audible input, with audible tones suppressing cochlear microphonic responses to infrasound in animals. These findings demonstrate that the response of the inner ear to infrasound is complex and needs to be understood in more detail before it can be concluded that the ear cannot be affected by wind turbine noise."

During the summer of 2009, this reviewer conducted a study of homes in Ontario where people had reported adverse health effects that they associated with the operation of wind turbines in their communities[24]. The study involved collecting sound level data at the homes and properties of these people, many of who had abandoned their homes due to their problems. This study found that sound levels in the 1/3 octave bands below 20 Hz were often above 60 dB and in many cases above

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[23] Salt, Alec, "Responses of the ear to low frequency sounds, infrasound and wind turbines", Hearing Research, 2010. This work was supported by research grant RO1 DC01368 from NIDCD/NIH

[24] James, R. R., "Comments Related to EBR-010-6708 and -010-6516" Comment ID 123842, 2009

70 dB. Since the shape of the spectrum for wind turbine sound emissions is greatest at the blade passage frequency which was below the threshold for the instruments used it can be assumed that the sound pressure levels in the range of 0 to 10 Hz exceeded 70 dBA. Given the statement by Dr. Salt that vestibular responses would start at levels of 60 dBG or higher this data supports the hypothesis that there reason to consider the potential for a link between the dynamically modulated infra sound produced by wind turbines and reported adverse health effects. Since the time of that study at least five (5) homes have been purchased by the utility operators because of health effects on the owners and many others have been abandoned because the owners did not have the economic resources to hire an attorney to fight for a buy-out.

Adverse health effects related to inaudible low frequency and infra sound have been encountered before. Acoustical engineers in the Heating, Cooling and Air Conditioning (ASHRAE) field have suspected since the 1980's and confirmed in the late 1990's that dynamically modulated, but inaudible, low frequency sound from poor HVAC designs or installations can cause a host of symptoms in workers in large open offices[25]. The ASHRAE handbook devotes considerable attention to the design of systems to avoid these problems and has developed methods to rate building interiors (RC Mark II) to assess them for these low frequency problems[26]. The report on Ontario by this reviewer includes an Appendix that provides more detail on this aspect of how inaudible infra and low frequency sound can cause adverse health effects.

When infra and low frequency sound is in the less-audible or inaudible range, it is often felt rather than heard. Unlike the A-weighted component, the low-frequency component of wind turbine noise "*can penetrate the home's walls and roof with very little low frequency noise reduction.*[27]" Further, as discussed in the 1990 NASA study the inside of homes receiving this energy can resonate and cause an increase of the low frequency energy over and above what was outside the home. Acoustic modeling for low frequency sound emissions of ten 2.5 MW turbines indicated "*that the one mile low frequency results are only 6.3 dB below the 1,000 foot one turbine example.*[28]" This makes the infra and low frequency sound immissions from wind turbines a potential problem over an even larger area than the audible sounds, such as blade swish and other wind turbine noises in the mid to high frequency range.

The acoustical consultant that does not practice in this field may not be as aware of the problems of amplitude modulated, in-audible low frequency sound identified by the ASHRAE engineers. Many have not integrated these new understandings of how infra and low frequency sound can affect the vestibular organs into their work on community noise. These levels were only a few years ago considered too low to cause any physical response. Today, there is a renewed interest in these effects. A paper titled: Infrasound, The Hidden Annoyance of Industrial Wind Turbines, by Prof. Claude Renard of the Naval College and Military School of the Fleet (France) concludes:

> "*The information given above is enough to understand that it is better not to be exposed to infrasound which propagates far from its point of origin and against which it is impossible to protect oneself due to the long wavelengths.*

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[25] Persson Waye, Kirsten, Rylander, R., Benton, S., Leventhall, H. G., Effects of Performance and Work Quality Due to Low Frequency Ventilation Noise, Journal of Sound and Vibration, (1997) 2005(4), 467-474.

[26] The study also showed that NC curves are not able to predict rumble. This use of NC curves was disproved in the 1997 Persson Waye, Leventhall study. Use of the RC Mark II procedures is more appropriate for this use.

[27] Kamperman and James (2008), p. 3.

[28] Id., p. 12

> *"Those most affected by exposure to infrasound are rural inhabitants living in proximity to wind turbines, and those working in air-conditioned offices.*
>
> *"The people in the former category are exposed to the infrasound 24 hours a day, whereas people in the latter category are only exposed to infrasound 6 hours a day.*
>
> *"The most important issue is therefore to know what intensity of infrasound can be tolerated without inconvenience over these periods of time.*
>
> *"We do not have the answer to this question."*

Impact on Wildlife

In the early 1990's the US DOD conducted a series of studies to identify the impact of high noise levels on the soldier's ability to avoid detection and to communicate as a team. The results of these studies showed that high noise levels, as are found inside military vehicles like tanks, greatly reduce the ability of the soldiers to identify and eliminate the enemy. They also result in a higher kill rate for our troops. This is not an difficult argument to understand. If the sound levels are high enough to limit team communication then mistakes are made and that slows response time. If the soldier is trying to avoid the enemy at a perimeter guard post, then the higher the sound level from machines on the post, the smaller shorter the distance is for the soldier to hear the sound of an approaching enemy. The results of the studies was that hearing health and noise became field readiness issues that were at the top of the lists for correcting. A soldier today is equipped with devices to improve the listening area and noise inside military vehicle cabins is being reduced.

There is an equivalent issue with wildlife. Reference 10, "The costs of chronic noise exposure for terrestrial organisms" presents the similar problems increased noise in the habitat makes for wildlife. While the focus of this review is on the effects of noise on the human population it must be understood that there will be a wider effect throughout the foot print of the project and extending into the wilderness areas of the Anza-Borrego Desert State Park. This effect will extend out to distances of 2 km or more from the boundary of the Project but will be most severe inside that boundary where sound levels from turbines may be as high as 60 dBA or more. The listening radius for wildlife that use sound for mating calls and predator avoidance shrinks by half for every 6 dB increase in the background sound level. For wildlife that are close to turbines this may have a dramatic effect on reproduction rates and kills. Decreasing the listening radius so dramatically may potentially make some of the wildlife an "endangered species" for this region. **P170-24**

Evidence of wind farm noise exceeding certificate of approval levels

In the 2008 manuscript by George Kamperman, Bd. Cert. INCE, P.E. and myself we set criteria designed to protect the public health. We stated that a setback of at least 1.25 miles was needed to achieve this goal[29]. In this community, an even larger setback distance is warranted. The population of Ocotillo with pre-existing medical conditions may be susceptible to adverse health effects at levels lower than the general population. Given that the World Health Organization's 2009 Nighttime Noise Guidelines find that the Threshold for Adverse Health Effects is 40 dBA at night outside a home, the results shown in the tables and contour maps of the EIS/EIR, once adjusted for confidence limits and high wind shear conditions, show that 40 dBA will be exceed under all four scenarios in Ocotillo. **P170-25**

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[29] Kamperman, G.W., Bd.Cert. INCE, P.E., James, R.R. INCE, "The 'How To' Guide to Siting Wind Turbines To Prevent Health Risks Fro Sound, 2008.

Conclusion

It is the opinion of this reviewer, based on his personal experience and the review described in this document that a properly conducted study would identify higher sound levels and higher annoyance levels than presented in the EIS/EIR. More homes will have sound levels that exceed 40 dBA, some by as much as 8 dBA or more. When adjusted for known tolerances of algorithms and measurements used to construct the model, the increased sound power emitted by wind turbines at night under conditions of high wind shear, and normalized to account for the quiet rural community and impulsive character of the wind turbines both the BLM's L_{dn} and Imperial's CNEL criteria will be exceeded. The WHO nighttime limits of 40 dBA for safe sleep and avoidance of adverse health effects will also be exceeded. **P170-26**

The soundscape in non-residential areas used for campgrounds and outdoor recreation in the adjacent State Park will no longer be the natural sounds of nature but instead the industrial sounds of wind turbines. The belief that the noise from the highways will somehow 'mask' the wind turbine sounds is not supported by current research. Further, there is reason to be concerned that for a sub-set of the people in the community the infrasound and low frequency content of the wind turbine noise will pose additional health risks due to interactions with their organs of balance. **P170-27**

These concerns are not hypothetical. There are many similar large scale wind turbine projects operating in the U.S. and around the world. A fair number of these projects result in complaints from people living near or inside the project's footprint of night time sleep disturbance and symptoms that are part of wind turbine syndrome. These projects were granted permits based on the same process of assessing background sound levels and computer modeling that were used for the Project. Given the analysis above it is reasonable to conclude that this project will join the ranks of wind utilities that cause adverse health conditions and noise pollution if it is approved. **P170-28**

This project should be rejected based on the concerns raised in this report. None of the alternative scenarios are compatible with the community and current land use. **P170-29**

In the opinion of this reviewer the Project will result in the exposure of persons to or generation of noise levels in excess of BLM Guideline, standards established in the Imperial County noise ordinance, and also exceed the WHO 2009 nighttime guidelines setting of 40 dBA (Leq) at night as the threshold for adverse health effects. It will also result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project. **P170-30**

The Project, as currently proposed should be rejected. **P170-31**

End of Review

Richard R. James, INCE
For E-Coustic Solutions

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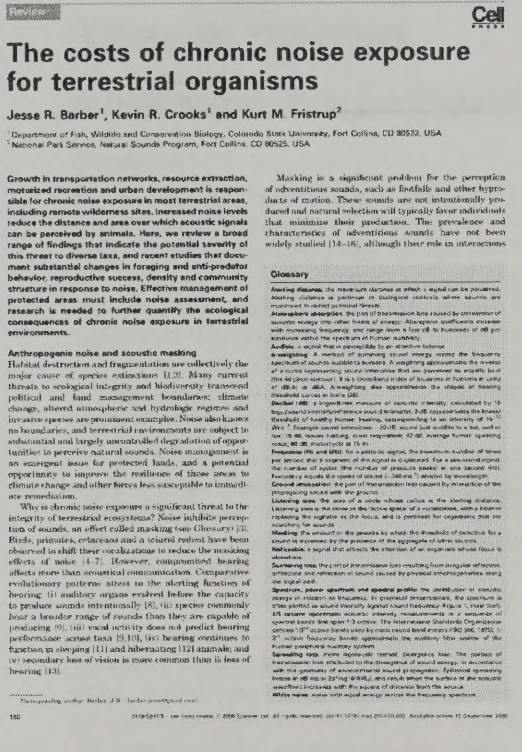
October 5, 2011

References
Submitted Separately



Review

The costs of chronic noise exposure for terrestrial organisms

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Growth in transportation networks, resource extraction, motorized recreation and urban development is responsible for chronic noise exposure in most terrestrial areas, including remote wilderness sites. Increased noise levels reduce the distance and area over which acoustic signals can be perceived by animals. Here, we review a broad range of findings that indicate the potential severity of this threat to diverse taxa, and recent studies that document substantial changes in foraging and anti-predator behavior, reproductive success, density and community structure in response to noise. Effective management of protected areas must include noise assessment, and research is needed to further quantify the ecological consequences of chronic noise exposure in terrestrial environments.

Anthropogenic noise and acoustic masking

Habitat destruction and fragmentation are collectively the major cause of species extinctions [1,2]. Many current threats to ecological integrity and biodiversity transcend political and land management boundaries: climate change, altered atmospheric and hydrologic regimes and invasive species are prominent examples. Noise also knows no boundaries, and terrestrial environments are subject to substantial and largely uncontrolled degradation of opportunities to perceive natural sounds. Noise management is an emergent issue for protected lands, and a potential opportunity to improve the resilience of these areas to climate change and other forces less susceptible to immediate remediation.

Why is chronic noise exposure a significant threat to the integrity of terrestrial ecosystems? Noise inhibits perception of sounds, an effect called masking (see Glossary) [3]. Birds, primates, cetaceans and a sciurid rodent have been observed to shift their vocalizations to reduce the masking effects of noise [4–7]. However, compromised hearing affects more than acoustical communication. Comparative evolutionary patterns attest to the alerting function of hearing: (i) auditory organs evolved before the capacity to produce sounds intentionally [8], (ii) species commonly hear a broader range of sounds than they are capable of producing [9], (iii) vocal activity does not predict hearing performance across taxa [9,10], (iv) hearing continues to function in sleeping [11] and hibernating [12] animals; and (v) secondary loss of vision is more common than is loss of hearing [13].

Masking is a significant problem for the perception of adventitious sounds, such as footfalls and other byproducts of motion. These sounds are not intentionally produced and natural selection will typically favor individuals that minimize their production. The prevalence and characteristics of adventitious sounds have not been widely studied [14–16], although their role in interactions

Glossary

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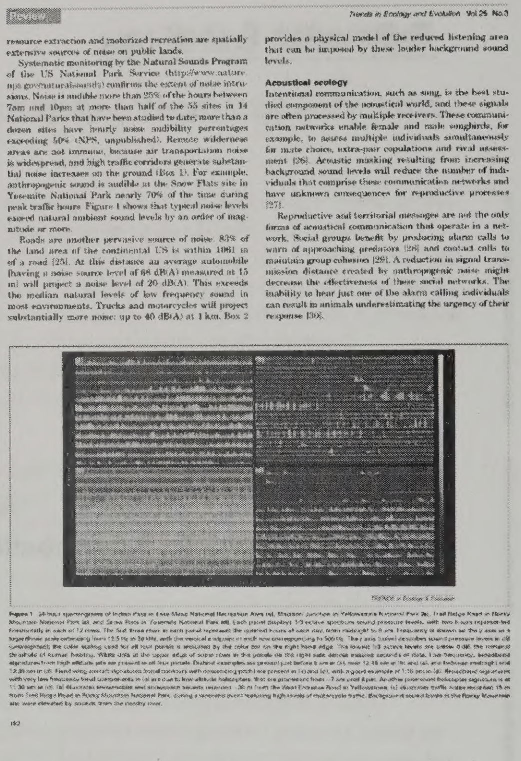

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resource extraction and motorized recreation are spatially extensive sources of noise on public lands.

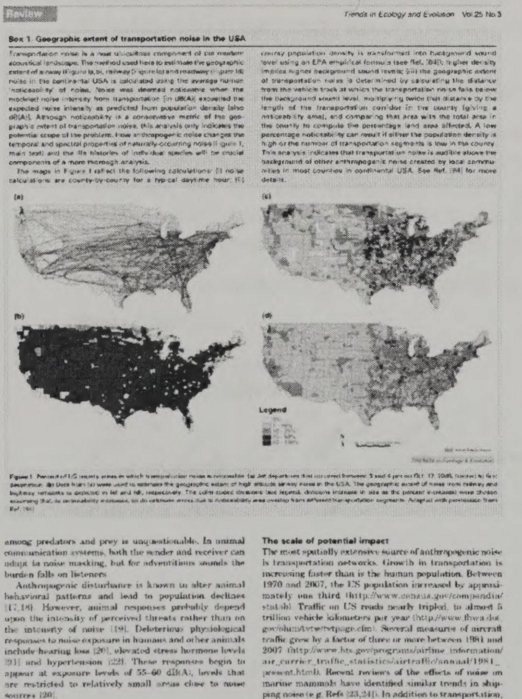
Systematic monitoring by the Natural Sounds Program of the US National Park Service (http://www.nature.nps.gov/naturalsounds) confirms the extent of noise intrusions. Noise is audible more than 25% of the hours between 7am and 10pm at more than half of the 55 sites in 14 National Parks that have been studied to date; more than a dozen sites have hourly noise audibility percentages exceeding 50% (NPS, unpublished). Remote wilderness areas are not immune, because air transportation noise is widespread, and high traffic corridors generate substantial noise increases on the ground (Box 1). For example, anthropogenic sound is audible at the Snow Flats site in Yosemite National Park nearly 70% of the time during peak traffic hours. Figure 1 shows that typical noise levels exceed natural ambient sound levels by an order of magnitude or more.

Roads are another pervasive source of noise: 83% of the land area of the continental US is within 1061 m of a road [25]. At this distance an average automobile (having a noise source level of 68 dB(A) measured at 15 m) will project a noise level of 20 dB(A). This exceeds the median natural levels of low frequency sound in most environments. Trucks and motorcycles will project substantially more noise: up to 40 dB(A) at 1 km. Box 2 provides a physical model of the reduced listening area that can be imposed by these louder background sound levels.

Acoustical ecology

Intentional communication, such as song, is the best studied component of the acoustical world, and these signals are often processed by multiple receivers. These communication networks enable female and male songbirds, for example, to assess multiple individuals simultaneously for mate choice, extra-pair copulations and rival assessment [26]. Acoustic masking resulting from increasing background sound levels will reduce the number of individuals that comprise these communication networks and have unknown consequences for reproductive processes [27].

Reproductive and territorial messages are not the only forms of acoustical communication that operate in a network. Social groups benefit by producing alarm calls to warn of approaching predators [28] and contact calls to maintain group cohesion [29]. A reduction in signal transmission distance created by anthropogenic noise might decrease the effectiveness of these social networks. The inability to hear just one of the alarm calling individuals can result in animals underestimating the urgency of their response [30].



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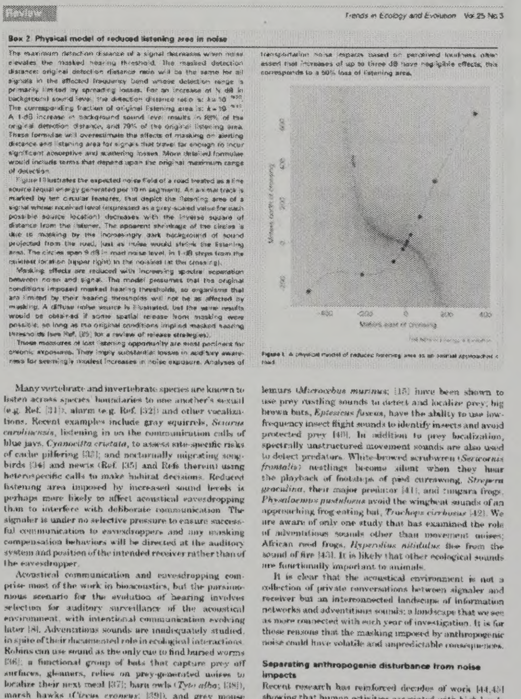
Box 1. Geographic extent of transportation noise in the USA

among predators and prey is unquestionable. In animal communication systems, both the sender and receiver can adapt to noise masking, but for adventitious sounds the burden falls on listeners.

Anthropogenic disturbance is known to alter animal behavioral patterns and lead to population declines [17,18]. However, animal responses probably depend upon the intensity of perceived threats rather than on the intensity of noise [19]. Deleterious physiological responses to noise exposure in humans and other animals include hearing loss [20], elevated stress hormone levels [21] and hypertension [22]. These responses begin to appear at exposure levels of 55–60 dB(A), levels that are restricted to relatively small areas close to noise sources [20].

The scale of potential impact

The most spatially extensive source of anthropogenic noise is transportation networks. Growth in transportation is increasing faster than is the human population. Between 1970 and 2007, the US population increased by approximately one third (http://www.census.gov/compendia/statab). Traffic on US roads nearly tripled, to almost 5 trillion vehicle kilometers per year (http://www.fhwa.dot.gov/ohim/tvtw/tvtpage.cfm). Several measures of aircraft traffic grew by a factor of three or more between 1981 and 2007 (http://www.bts.gov/programs/airline_information/air_carrier_traffic_statistics/airtraffic/annual/1981_present.html). Recent reviews of the effects of noise on marine mammals have identified similar trends in shipping noise (e.g. Refs [23,24]). In addition to transportation,



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Box 2. Physical model of reduced listening area in noise

Many vertebrate and invertebrate species are known to listen across species boundaries to one another's sexual (e.g. Ref. [31]), alarm (e.g. Ref. [32]) and other vocalizations. Recent examples include gray squirrels, *Sciurus carolinensis*, listening in on the communication calls of blue jays, *Cyanocitta cristata*, to assess site-specific risks of cache pilfering [33]; and nocturnally migrating songbirds [34] and newts (Ref. [35] and Refs therein) using heterospecific calls to make habitat decisions. Reduced listening area imposed by increased sound levels is perhaps more likely to affect acoustical eavesdropping than to interfere with deliberate communication. The signaler is under no selective pressure to ensure successful communication to eavesdroppers and any masking compensation behaviors will be directed at the auditory system and position of the intended receiver rather than of the eavesdropper.

Acoustical communication and eavesdropping comprise most of the work in bioacoustics, but the parsimonious scenario for the evolution of hearing involves selection for auditory surveillance of the acoustical environment, with intentional communication evolving later [8]. Adventitious sounds are inadequately studied, in spite of their documented role in ecological interactions. Robins can use sound as the only cue to find buried worms [36]; a functional group of bats that capture prey off surfaces, gleaners, relies on prey-generated noises to localize their next meal [37]; barn owls (*Tyto alba*; [38]), marsh hawks (*Circus cyaneus*; [39]), and grey mouse lemurs (*Microcebus murinus*; [15]) have been shown to use prey rustling sounds to detect and localize prey; big brown bats, *Eptesicus fuscus*, have the ability to use low-frequency insect flight sounds to identify insects and avoid protected prey [40]. In addition to prey localization, spectrally unstructured movement sounds are also used to detect predators. White-browed scrubwren (*Sericornis frontalis*) nestlings become silent when they hear the playback of footsteps of pied currawong, *Strepera graculina*, their major predator [41], and tungara frogs, *Physalaemus pustulosus* avoid the wingbeat sounds of an approaching frog-eating bat, *Trachops cirrhosus* [42]. We are aware of only one study that has examined the role of adventitious sounds other than movement noises: African reed frogs, *Hyperolius nitidulus* flee from the sound of fire [43]. It is likely that other ecological sounds are functionally important to animals.

It is clear that the acoustical environment is not a collection of private conversations between signaler and receiver but an interconnected landscape of information networks and adventitious sounds: a landscape that we see as more connected with each year of investigation. It is for these reasons that the masking imposed by anthropogenic noise could have volatile and unpredictable consequences.

Separating anthropogenic disturbance from noise impacts

Recent research has reinforced decades of work [44,45] showing that human activities associated with high levels of anthropogenic noise modify animal ecology: for example, the species richness of nocturnal primates, small ungulates and carnivores is significantly reduced within ~30 m of roads in Africa [46]; anuran species richness in Ottawa, Canada is negatively correlated with traffic density [47]; aircraft overflights disturb behavior and alter time budgets in harlequin ducks (*Histrionicus histrionicus*; [48]) and mountain goats (*Oreamnos americanus*; [49]); snowmobiles and off-road vehicles change ungulate vigilance behavior and space use, although no evidence yet links these responses to population consequences [50,51]; songbirds show greater nest desertion and abandonment, but reduced predation, within 100 m of off-road vehicle trails [52]; and both greater sage-grouse (*Centrocercus urophasianus*; [53]) and mule deer (*Odocoileus hemionus*; [54]) are significantly more likely to select habitat away from noise-producing oil and gas developments. Thus, based on these studies alone, it seems clear that activities associated with high levels of anthropogenic noise can re-structure animal communities; but, because none of these studies, nor the disturbance literature in general, isolates noise from other possible forces, the independent contribution of anthropogenic noise to these effects is ambiguous.

Other evidence also implicates quiet, human-powered activities, such as hiking and skiing, in habitat degradation. For example, a paired comparison of 28 land preserves in northern California that varied substantially in the number of non-motorized recreationists showed a five-fold decline in the density of native carnivores in heavily used sites [55]. Further evidence from the Alps indicates that outdoor winter sports reduce alpine black grouse, *Tetrao tetrix* populations [17] and data from the UK link primarily quiet, non-motorized recreation to reduced woodlark, *Lullula arborea* populations [18]. A recent meta-analysis of ungulate flight responses to human disturbance showed that humans on foot produced stronger behavioral reactions than did motorized disturbance [45]. These studies strengthen a detailed foundational literature suggesting that anthropogenic disturbance events are perceived by animals as predation risk, regardless of the associated noise levels. Disturbance evokes anti-predator behaviors, interferes with other activities that enhance fitness and, as the studies above illustrate, can lead to population decline [44]. Although increased levels of noise associated with the same disturbance type appear to accentuate some animal responses (e.g. Refs [41,45]), it is difficult to distinguish reactions that reflect increasingly compromised sensory awareness from reactions that treat greater noise intensity as an indicator of greater risk.

To understand the functional importance of intact acoustical environments for animals, experimental and statistical designs must control for the influence of other stimuli. Numerous studies implicating noise as a problem for animals have reported reduced bird densities near roadways (reviewed in Ref. [56]). An extensive study conducted in the Netherlands found that 26 of 43 (60%) woodland bird species showed reduced numbers near roads [57]. This research, similar to most road ecology work, could not isolate noise from other possible factors associated with transportation corridors (e.g. road mortality, visual disturbance, chemical pollution, habitat fragmentation, increased predation and invasive species along edges). However, these effects extended for over a mile into the forest, implicating noise as one of the most potent forces driving road effects [58]. Later work, with a smaller sample size, confirmed these results and contributed a significant finding: birds with higher frequency calls were less likely to avoid roadways than birds with lower frequency calls [59]. Coupled with the mounting evidence that several animals shift their call frequencies in anthropogenic noise [4–7], these data are suggestive of a masking mechanism.

A good first step towards disentangling disturbance from noise effects is exemplified by small mammal translocation work performed across roadways that varied greatly in traffic amount. The densities of white-footed mice, *Peromyscus leucopus* and eastern chipmunks *Tamias striatus* were not lower near roads and both species were significantly less likely to cross a road than cover the same distance away from roads, but traffic volume (and noise level) had no influence on this finding [60]. Thus, for these species, the influence of the road surface itself appears to outweigh the independent contributions of direct mortality and noise.

Recent findings on the effects of anthropogenic noise

Two research groups have used oil and gas fields as 'natural experiments' to isolate the effects of noise from other confounding variables. Researchers in Canada's boreal forest studied songbirds near noisy compressor stations (75–90 dB(A) at the source, 24 hrs a day, 365 days a year) and nearly identical (and much quieter) well pads. Both of these installations were situated in two to four ha clearings with dirt access roads that were rarely used. This design allowed for control of edge effects and other confounding factors that hinder interpretation of road impact studies. The findings from this system include reduced pairing success and significantly more first time breeders near loud compressor stations in ovenbirds (*Seiurus aurocapilla*; [61]), and a one-third reduction in overall passerine bird density [62]. Low territory quality in loud sites might explain the age structuring of this ovenbird population and, if so, implicates background sound level as an important habitat characteristic. In addition to the field data above, weakened avian pair preference in high levels of noise has been shown experimentally in the lab [63]. These data suggest masking of communication calls as a possible underlying mechanism; however the reduced effectiveness of territorial defense songs, reduced auditory awareness of approaching predators (see Box 3 for a discussion of the foraging/vigilance tradeoff in noise), or reduced capacity to detect acoustic cues in foraging, cannot be excluded as explanations of the results.

A second research group, working within natural gas fields in north-west New Mexico, US, used pinyon, *Pinus edulis*-juniper, *Juniperus osteosperma* woodlands adjacent to compressor stations as treatment sites and woodlands adjacent to gas wells lacking noise-producing compressors as quiet control sites [64]. The researchers were able to turn off the loud compressor stations to perform bird counts, relieving the need to adjust for detection differences in noise [62]. This group found reduced nesting species richness but in contrast to Ref.

of signal types: begging calls of bird chicks [66], alarm signals in ground squirrels [67], contact calls of primates [68], echolocation cries of bats [65] and sexual communication signals in birds, cetaceans and anurans [4–7,69]. Vocal adjustment probably comes at a cost to both energy balance and information transfer; however, no study has addressed receivers.

Masking also affects the ability of animals to use sound for spatial orientation. When traffic noise is played back to grey treefrog, *Hyla chrysoscelis* females as they attempt to localize male calls, they take longer to do so and are significantly less successful in correctly orienting to the male signal [70]. Similar studies with the European tree frog, *Hyla arborea* show decreased calling activity in played back traffic noise [71]. *H. arborea* individuals appear to be unable to adjust the frequency or duration of their calls to increase signal transmission, even at very high noise intensities (88 dB(A), [71]); although other frogs have been shown to slightly shift call frequencies upward in response to anthropogenic noise [69]. These are particularly salient points. It is likely that some species are unable to adjust the structure of their sounds to cope with noise even within the same group of organisms. These differences in vocal adaptability could partially explain why some species do well in loud environments and others do poorly [6,7,72].

Under many conditions, animals will minimize their movement sounds. For example, mice preferentially select quieter substrates on which to move [73]. Adventitious sounds of insects walking contain appreciable energy at higher frequencies (main energy ~3–30 kHz [16]) and are thus unlikely to be fully masked by most anthropogenic noise (<2 kHz [4–7]) but the spectral profile near many noise sources contains significant energy at higher frequencies (e.g. Ref [74]). Foundational work with owls and bats has shown that frequencies between approximately three and eight kHz are crucial for passive sound localization accuracy [38,75]. In fact, a recent laboratory study demonstrated that gleaning bats avoided hunting in areas with played back road noise that contained energy within this spectral band ([74]; Box 4).

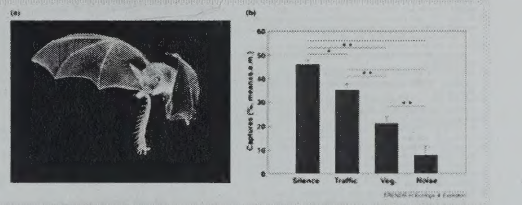
Adapting to a louder world

Animals have been under constant selective pressure to distinguish pertinent sounds from background noise. Two

Box 4. Effects of acoustic masking on acoustically specialized predators

Laboratory work has demonstrated that gleaning bats (who use prey-generated sounds to capture terrestrial prey; Figure 1a) avoid noise when foraging (Figure 1b). Interestingly, treefrogs, a favorite prey of some neotropical gleaning bats, tend to call from sites with high ambient noise levels (primarily from waterfalls) and bats prefer frog calls played back in quieter locations [91]. Extinction risk in bats correlates with low wing aspect ratios (a high cost and low wing-loading morphology), a trait that all gleaning bats share [42]. A recent analysis indicates that urbanization most strongly impacts bats with these wing shapes [33]. However, low wing aspect ratio is also correlated with habitat specialization, edge intolerance and low mobility [92,93], obscuring the links between a gleaning lifestyle, louder background sound levels and extinction risk as urbanization reduces available habitat, fragments landscapes and generates noise concomitantly.

A radio-tag study showed that a gleaning bat, *Myotis bechsteinii*, was less likely to cross a roadway (three of 34 individuals) than was a sympatric open-space foraging bat, *Barbastella barbastellus* (five out of six individuals; [94]), implicating noise as a fragmenting agent for some bats. The latter species hunts flying insects using echolocation (an auditory behavior that uses ultrasonic signals above the spectrum of anthropogenic noise) [94]. Similar findings suggest acoustically mediated foragers are at risk: terrestrial insectivores were the only avian ecological guild to avoid road construction in the Amazon [95] and human-altered landscapes limited provisioning rates of saw-whet owls [96]. That these animals plausibly rely on sound for hunting might not be coincidental.



TRENDS in Ecology & Evolution

Figure 1. Gleaning bats avoid hunting in noise. The pallid bat, *Antrozous pallidus* (a), relies upon prey-generated movement sounds to localize its terrestrial prey. Recent work demonstrates that another gleaning bat, the greater mouse-eared bat, *Myotis myotis*, avoids foraging in noise [74]. (b) A laboratory two-compartment choice experiment showed that this bat preferred to forage in the compartment with played-back silence versus the compartment with played-back traffic, wind-blown vegetation or white noise. This pattern held true whether the percentage of flight time, compartment entering counts, the first 25 captures per session or overall capture percentage were compared across silent and noise playback compartments. Asterisks indicate the results of post repeated measure ANOVA, paired t-tests (**P< 0.01, *P< 0.05, N=7 bats). The differences between noise types (traffic, vegetation and white noise) probably reflect increased spectral overlap between prey-generated movement sounds and the spectral profile of the noise. Reproduced with permission from Scott Altenbach (a) and Ref. [74] (b).

Box 3. Do rising background sound levels alter vigilance behavior?

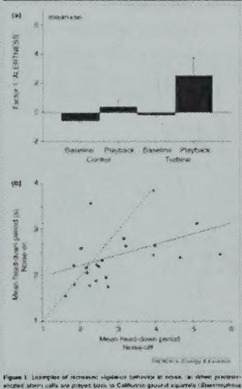


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Figure 1. Examples of increased vigilance behavior in noise. (a) When predator-elicited alarm calls are played back to California ground squirrels (*Spermophilus beecheyi*), adults show a greater increase in vigilance behavior at a site heavily impacted by anthropogenic noise, under power generating wind turbines, than in a quiet control site [67]. (b) Further work on vigilance behaviors in noise comes from controlled laboratory work with foraging chaffinches (*Fringilla coelebs*). In noise these birds decrease the interval between head-up scanning bouts, which results in fewer pecks and, thus, reduced food intake [36]. Dots depict the mean head-down period for each individual with and without white noise playback. Points below the dashed line (slope = 1) document individuals who increased scanning effort in noise. The solid regression line shows that the general trend was a more dramatic response from individuals with the lowest scanning effort. (a) adapted and (b) reproduced, with permission from Refs [67] and [36], respectively.

Predation risk and human disturbance increase vigilance behaviors (e.g. Refs [50,80]), at a cost to foraging efficiency [37,85]. Habitat features that influence predator detection, such as vegetation height, predict predation risk [86]. If background sound level interferes with the ability of an animal to detect predators, risk can increase. Do animals perceive background sound level as a habitat characteristic that predicts predation risk? Two recent studies document increased vigilance behaviors in high levels of noise (Figure I). It seems probable that these increased anti-predator behaviors are the result of attempted visual compensation for lost auditory awareness. Evidence from ungulates near roads suggests this is the case (Figure II); however, the distinct contributions of traffic as perceived threat and traffic noise as a sensory obstacle are confounded in road studies. Experimental research with birds and mammals suggests that lost visual awareness owing to habitat obstruction reduces food-searching bouts and increases vigilance (reviewed in Ref. [87]). Although no evidence exists (but see Ref. [64]), if noise shifts the spatial distribution of foraging effort, then plant growth and seed dispersal could also be altered.

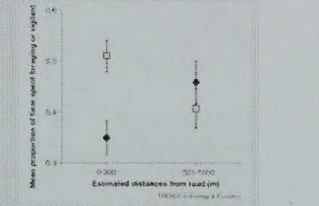

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Figure II. An example of the foraging-vigilance tradeoff. Pronghorn (*Antilocapra Americana*) spend more time being vigilant (squares) and less time foraging (diamonds) within 300 meters of a road [86]. Future experiments should attempt to separate the roles of traffic as perceived threat and reduced auditory awareness on these tradeoffs. Reproduced, with permission, from Ref. [86].

[62], no reduction in overall nesting density. Unexpectedly, nest success was higher and predation levels lower in loud sites (also see Ref. [52]). The change in bird communities between loud and quiet sites appears to be driven by site preference; the response to noise ranged from positive to negative, with most responses being negative (e.g. three species nested only in loud sites and 14 species nested only in quiet, control sites). However, given the change in community structure, habitat selection based on background sound level is not the only interpretation of these data, as birds might be using cues of reduced competition pressure or predation risk to make habitat decisions [64]. The major nest predator in the study area, the western scrub jay, *Aphelocoma californica*, was significantly more likely to occupy quiet sites, which might explain the nest predation data [64]. It is probable that nest predators rely heavily on acoustic cues to find their prey. The study also found that the two bird species most strongly associated with control sites produce low-frequency communication calls. These observations suggest masking as an explanatory factor for these observed patterns. This work highlights the potential complexity of the relationship between noise exposure and the structure and function of ecological systems.

Adjusting temporal, spectral, intensity and redundancy characteristics of acoustic signals to reduce masking by noise has been demonstrated in six vertebrate orders [4–7,65]. These shifts have been documented in a variety

Box 5. Outstanding questions

- Multiple studies with birds have demonstrated signal shifts in anthropogenic noise that does not substantially overlap in frequency with the birds' song [4–7,72]. To what extent does low-frequency anthropogenic noise inhibit perception of higher frequency signals? Mammals appear more prone to the 'upward spread' of masking than do birds [85,97]. Noise commonly elevates low frequency ambient sound levels by 40 dB or more, so small amounts of spectral 'leakage' can be significant. Laboratory studies should be complemented by field studies that can identify the potential for informational or attentional effects [98]. This work should use anthropogenic noise profiles and not rely on artificial white noise as a surrogate. Furthermore, we suggest that future studies measure or model sound levels (both signal and background) at the position of the animal receiver (*sensu* Ref. [23]).
- What roles do behavioral and cognitive masking release mechanisms [85] have in modifying the capacity of free-ranging animals to detect and identify significant sounds? Only one study has examined the masked hearing thresholds of natural vocal signals in anthropogenic noise [97]. This work found that thresholds for discrimination between calls of the same bird species were consistently higher than were detection thresholds for the same calls [97]. This highlights the lack of knowledge concerning top-down cognitive constraints on signal processing in noise. Can noise divide attention and reduce task accuracy by forcing the processing of multiple streams of auditory information simultaneously [39]?
- Do animals exploit the temporal patterning of anthropogenic noise pollution (see Ref. [4])? Alternatively, what constitutes a chronic exposure and how does this vary in relation to diel activity schedules?
- Does noise amplify the barrier effects of fragmenting agents, such as roads [94,100]?
- What routes (exaptation, behavioral compensation, phenotypic plasticity and/or contemporary evolution) lead to successful tolerance of loud environments?
- What role does audition have in vigilance behaviors? Are visually mediated predators at an advantage in loud environments when prey animals rely upon acoustical predator detection?
- Do animals directly perceive background sound level as a habitat characteristic related to predation risk? A noise increase of 3 dB(A) is often identified as 'just perceptible' for humans, and an increase of 10 dB(A) as a doubling of perceived loudness. These correspond to 30% and 90% reductions in alerting distance, respectively. Do organisms assess reduced alerting distance by monitoring other acoustical signals?

examples include penguin communication systems being shaped by wind and colony noise [76] and frog systems driven to ultrasonic frequencies by stream noise [77]. A meta-analysis of the acoustic adaptation hypothesis for birdsong (the idea that signals are adapted to maximize propagation through the local habitat) found only weak evidence for this claim [78]. Physiological constraints and selective forces from eavesdropping could explain this weak relationship [78], in addition to variation of noise profiles across nominally similar habitat types (e.g. insect noise, [79]).

Phenotypic plasticity enables one adaptation to anthropogenic noise. The open-ended song learning documented in great tits, *Parus major* helps explain the consistent song shifts observed in all ten comparisons between urban and rural populations [72]. Contemporary evolution (fewer than a few hundred generations) has now been quantified in several systems [80] and we might anticipate similar microevolutionary changes in many species with rapid generation times that consistently experience acoustical environments dominated by noise, particularly in increasingly fragmented landscapes.

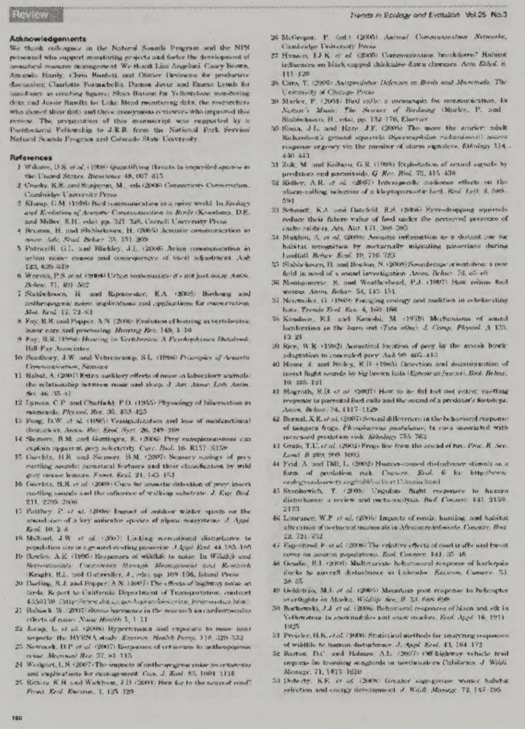
Perhaps the greatest predictors of the ability of a given species to succeed in a louder world will be the degree of temporal and spectral overlap of biologically crucial signals with anthropogenic noise (Figure 1), and their flexibility to compensate with other sensory modalities (e.g. vision) when auditory cues are masked. Given known sensory biases in learning [81], many animals will be constrained in their ability to shift from acoustical inputs to other sensory cues for dynamic control of complex behavioral sequences.

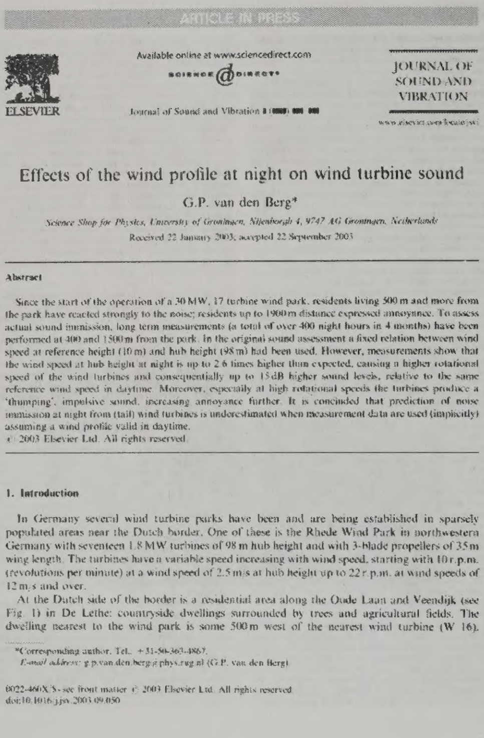
Conclusions and recommendations

The constraints on signal reception imposed by background sound level have a long history of being researched in bioacoustics, and it is increasingly clear that these constraints underlie crucial issues for conservation biology. Questions have been raised about the value of behavioral studies for conservation practice (for a review see Ref [82]), but ethological studies of auditory awareness and the consequences of degraded listening opportunities are essential to understanding the mechanisms underlying ecological responses to anthropogenic noise (Box 5). These studies are more challenging to execute than observation of salient behavioral responses to acute noise events, but they offer opportunities to explore fundamental questions regarding auditory perception in natural and disturbed contexts.

Chronic noise exposure is widespread. Taken individually, many of the papers cited here offer suggestive but inconclusive evidence that masking is substantially altering many ecosystems. Taken collectively, the preponderance of evidence argues for immediate action to manage noise in protected natural areas. Advances in instrumentation and methods are needed to expand research and monitoring capabilities. Explicit experimental manipulations should become an integral part of future adaptive management plans to decisively identify the most effective and efficient methods that reconcile human activities with resource management objectives [83].

The costs of noise must be understood in relation to other anthropogenic forces, to ensure effective mitigation and efficient realization of environmental goals. Noise pollution exacerbates the problems posed by habitat fragmentation and wildlife responses to human presence; therefore, highly fragmented or heavily visited locations are priority candidates for noise management. Noise management might also offer a relatively rapid tool to improve the resilience of protected lands to some of the stresses imposed by climate change. Shuttle buses and other specialized mass transit systems, such as those used at Zion and Denali National Parks, offer promising alternatives for visitor access that enable resource managers to exert better control over the timing, spatial distribution, and intensity of both noise and human disturbance. Quieting protected areas is a prudent precaution in the face of sweeping environmental changes, and a powerful affirmation of the wilderness values that inspired their creation.





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Effects of the wind profile at night on wind turbine sound

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Abstract

Since the start of the operation of a 30 MW, 17 turbine wind park, residents living 500 m and more from the park have reacted strongly to the noise; residents up to 1900 m distance expressed annoyance. To assess actual sound immission, long term measurements (a total of over 400 night hours in 4 months) have been performed at 400 and 1500 m from the park. In the original sound assessment a fixed relation between wind speed at reference height (10 m) and hub height (98 m) had been used. However, measurements show that the wind speed at hub height at night is up to 2.6 times higher than expected, causing a higher rotational speed of the wind turbines and consequentially up to 15 dB higher sound levels, relative to the same reference wind speed in daytime. Moreover, especially at high rotational speeds the turbines produce a 'thumping', impulsive sound, increasing annoyance further. It is concluded that prediction of noise immission at night from (tall) wind turbines is underestimated when measurement data are used (implicitly) assuming a wind profile valid in daytime.

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1. Introduction

In Germany several wind turbine parks have been and are being established in sparsely populated areas near the Dutch border. One of these is the Rhede Wind Park in northwestern Germany with seventeen 1.8 MW turbines of 98 m hub height and with 3-blade propellers of 35 m wing length. The turbines have a variable speed increasing with wind speed, starting with 10 r.p.m. (revolutions per minute) at a wind speed of 2.5 m/s at hub height up to 22 r.p.m. at wind speeds of 12 m/s and over.

At the Dutch side of the border is a residential area along the Oude Laan and Veendijk (see Fig. 1) in De Lethe: countryside dwellings surrounded by trees and agricultural fields. The dwelling nearest to the wind park is some 500 m west of the nearest wind turbine (W 16).

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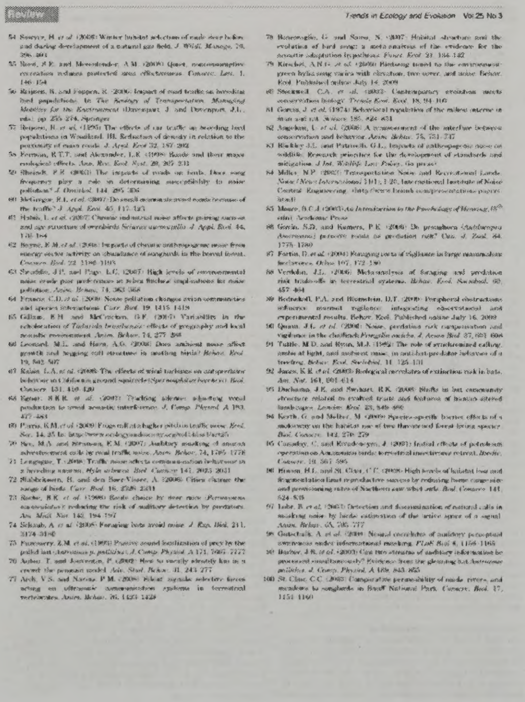

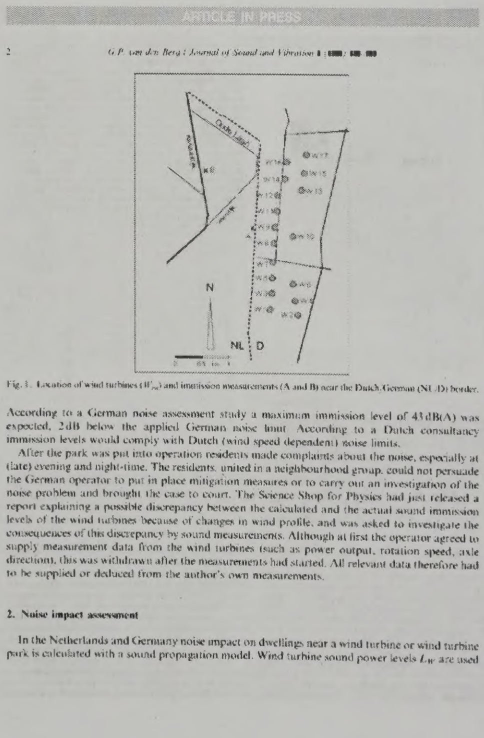

Fig. 1. Location of wind turbines (W_{nr}) and immission measurements (A and B) near the Dutch/German (NL/D) border.

According to a German noise assessment study a maximum immission level of 43 dB(A) was expected, 2 dB below the applied German noise limit. According to a Dutch consultancy immission levels would comply with Dutch (wind speed dependent) noise limits.

After the park was put into operation residents made complaints about the noise, especially at (late) evening and night-time. The residents, united in a neighbourhood group, could not persuade the German operator to put in place mitigation measures or to carry out an investigation of the noise problem and brought the case to court. The Science Shop for Physics had just released a report explaining a possible discrepancy between the calculated and the actual sound immission levels of the wind turbines because of changes in wind profile, and was asked to investigate the consequences of this discrepancy by sound measurements. Although at first the operator agreed to supply measurement data from the wind turbines (such as power output, rotation speed, axle direction), this was withdrawn after the measurements had started. All relevant data therefore had to be supplied or deduced from the author's own measurements.

2. Noise impact assessment

In the Netherlands and Germany noise impact on dwellings near a wind turbine or wind turbine park is calculated with a sound propagation model. Wind turbine sound power levels L_W are used as input for the model, based on measured or estimated data. In Germany a single 'maximum' sound power level (at 95% of maximum electric power) is used to assess sound impact. In the Netherlands sound power levels related to wind speeds at 10 m height are used; the resulting sound immission levels are compared to wind speed-dependent noise limits. Implicitly this assessment is based on measurements in daytime and does not take into account atmospheric conditions affecting the wind profile, especially at night.

In the Netherlands a national calculation model is used [1] to assess noise impact, as is the case in Germany [2]. According to Kerkers [3] there are, at least in the case of these wind turbines, no significant differences between both models.

In both sound propagation models the sound immission level L_{imm} at a specific observation point is a summation over j sound power octave band levels L_{Wj} of k sources (turbines), reduced with attenuation factors $D_{j,k}$:

$$L_{imm} = 10\log\left[\sum_j \sum_k 10^{(L_{Wj} - D_{j,k})/10}\right], \tag{1}$$

where L_{Wj}, assumed to be identical for all k turbines, is a function of rotational speed. $D_{j,k}$ is the attenuation due to geometrical spreading (D_{geo}), air absorption (D_{air}) and ground absorption (D_{ground}): $D_{j,k} = D_{geo} + D_{air} + D_{ground}$.

Eq. (1) is valid for a downwind situation. For long-term assessment purposes a meteorological correction factor is applied to (1) to account for an 'average atmosphere'. When comparing calculated and measured sound immission levels in this study no such meteo-correction is applied.

3. Wind turbines noise perception

There is a distinct audible difference between the night and daytime wind turbine sound at some distance from the turbines. On a summer's day in a moderate or even strong wind the turbines may only be heard within a few hundred metres and one might wonder why residents should complain of the sound produced by the wind park. However, on quiet nights the wind park can be heard at distances of up to several kilometres when the turbines rotate at high speed. On these nights, certainly at distances between 500 and 1000 m from the wind park, one can hear a low pitched thumping sound with a repetition rate of about once a second (coinciding with the frequency of blades passing a turbine mast), not unlike distant pile driving, superimposed on a constant broadband 'noisy' sound. A resident living at 1.5 km from the wind park describes the sound as 'an endless train'. In daytime these pulses are not clearly audible and the sound is less intrusive or even inaudible (especially in strong winds because of the then high ambient sound level).

In the wind park the turbines are audible for most of the (day and night) time, but the thumping is not evident, although a 'swishing' sound—a regular variation in sound level caused by the pressure variation when a blade passes a turbine mast—is readily discernible. Sometimes a rumbling sound can be heard, but it is difficult to assign it, by ear, to a specific turbine or to assess its direction.

4. Stability-dependent wind profiles

Usually a fixed relation is assumed between the wind speed v_h at height h and the wind speed v_{ref} at a reference height h_{ref} (usually 10 m), which is the widely used logarithmic wind profile with surface roughness z as the only parameter. See for example the international recommendations for wind turbine noise emission measurements [4,5]. For height h the wind speed v_h is calculated as follows:

$$v_h = v_{ref}\,\log(h/z)/\log(h_{ref}/z). \tag{2}$$

This equation is an approximation of the wind profile in the turbulent boundary layer of a neutral atmosphere, when the air is mixed by turbulence resulting from friction with the surface of the earth. During daytime thermal turbulence is added, especially when the heating of the earth surface by the sun is significant. At night-time a neutral atmosphere, characterized by the adiabatic temperature gradient, occurs under heavy cloud and/or at relatively high wind speeds. When there is some clear sky and in the absence of strong winds the atmosphere becomes stable because of radiative cooling of the surface: the wind profile changes and can no longer be adequately described by Eq. (2). The effect of the change to a stable atmosphere is that, relative to a given wind speed at 10 m height in daytime, at night there is a higher wind speed at hub height and thus a higher turbine sound power level; also there is a lower wind speed below 10 m and thus less wind-induced sound in vegetation. According to measurements by Holtslag [6] in a non-neutral atmosphere (either stable or unstable) a correction must be added to the logarithmic terms in the wind profile according to Eq. (2):

$$v_h = v_{ref}[\log(h/z) - \Psi_m]/[\log(h_{ref}/z) - \Psi_m], \tag{3}$$

where $\Psi_m = \Psi_m(h/L)$ is a rather elaborate function of height h and Monin–Obukhov length L. L is a stability measure and is positive for a stable, negative for an unstable atmosphere; for a neutral atmosphere L is a large number, either positive or negative. For calculations of sound propagation in the atmosphere Kühner [7] proposes a simple equation used in the German Air Quality Guideline "TA-Luft" [8]:

$$v_h = v_{ref}(h/h_{ref})^m, \tag{4}$$

where m is a number that depends on stability.

Stability can be categorized in Pasquill classes that depend on observations of wind speed and cloud cover (see, e.g. Ref. [9]). They are usually referred to as classes A (very unstable) through F (very stable). In "TA-Luft" a closely related classification is given (again closely related, according to Kühner [7], to the international Turner classification). An overview of stability classes with the appropriate value of m is given in Table 1. In Fig. 2 wind profiles are given as measured by Holtslag [6], as well as wind profiles according to Eqs. (2) and (4).

According to long-term data from Eelde and Leeuwarden [10], two meteorological measurement sites of the KNMI (Royal Dutch Meteorological Institute) in the northern part of the Netherlands, a stable atmosphere (Pasquill classes E and F) at night occurs for a considerable proportion of night-time: 34% and 32%, respectively.

According to Eq. (2) the ratio of wind speed at hub height (98 m) to wind speed at reference height, over land with low vegetation ($z = 3$ cm), would be $f_{log} = v_{98}/v_{10} = 1.4$. According to Eq. (4) and Table 1 this ratio would be 1.2 in a very unstable atmosphere and $f_{stable} = 2.5 = 1.8 f_{log}$ in a (very) stable atmosphere.

Table 1
Stability classes and factor m

Pasquill class	Name	Comparable stability class "TA-Luft" [8]	m
A	Very unstable	V	0.09
B	Moderately unstable	IV	0.20
C	Neutral	III2	0.22
D	Slightly stable	III1	0.28
E	Moderately stable	II	0.37
F	(Very) stable	I	0.41

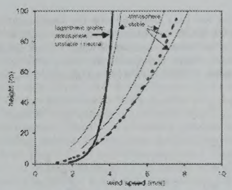

Fig. 2. Measured wind profiles (thin lines, [6]) and wind profile according to TA Luft (dotted line, [8]) in a stable atmosphere, and wind profile according to logarithmic model of formula 2 with $z = 3$ cm (bold line).

The fact that wind speeds at 10 m height may not be a good, unique predictor for hub height wind speeds has been put forward by Rudolphi [11]. He concluded from measurements that wind speed at 10 m height is not a good measure for wind turbine sound power: according to his measurements near a 58 m hub height wind turbine at night the turbine sound level was 5 dB higher than expected. This conclusion was not followed by a more thorough investigation.

The question addressed in this study is: what is the influence of the change in wind profile on the sound immission near (tall) wind turbines?

5. Measurement method

Sound immission measurements were made over 1435 hours, of which 417 hours were at night, within four months at two consecutive locations with an unmanned Sound and Weather Measurement System (SWMS) consisting of a type 1 sound level meter with a microphone at 4.5 m height with a 9 cm diameter foam wind shield, and a wind meter at 10 m as well as at 2 m height. Every second, wind speed and wind direction (at 10 and 2 m height) and the A-weighted sound level were measured; the measured data are stored as statistical distributions over 5 min intervals. From these distributions all necessary wind data and sound levels can be calculated, such as average wind speed, median wind direction or equivalent sound level and any percentile (steps of 5%) wind speed, wind direction or sound level, in intervals of 5 min or multiples thereof.

Also complementary measurements were done with logging types 1 and 2 sound level meters and a type 1 spectrum analyzer to measure immission sound levels in the residential area over limited periods ([12], not reported here), and emission levels near the wind turbines. Emission levels were measured according to international standards [4,5], but for practical purposes the method could not be adhered to in detail; with respect to the recommended values a smaller reflecting board was used for the microphone (30 × 44 cm^2 instead of a 1 m diameter circular board) and a smaller distance to the turbine (equal to tower height instead of tower height + blade length); reasons for this are given in a separate paper [13]. Also it was not possible to carry out emission measurements with only one turbine in operation.

6. Results: sound emission

Emission levels L_{eq} measured very close to the centre of a horizontal, flat board at a distance R from a turbine hub can be converted to a turbine sound power level L_W [4,5]:

$$L_W = L_{eq} - 6 + 10\log(4\pi R^2). \tag{5}$$

From earlier measurements [3] a wind speed dependence of L_W was established as given in Table 2. As explained above, the wind speed at 10 m height is not considered a reliable single measure for the turbine sound power. Rotational speed is a better measure.

Emission levels have been measured, typically for 5 min per measurement, at nine turbines on seven different days with different wind conditions. The results are plotted in Fig. 3; the sound power level is plotted as a function of rotational speed N. N is proportional to wind speed at hub height and could be determined by counting, typically during 1 min, blades passing the turbine mast. This counting procedure is not very accurate (accuracy per measurement is $\leqslant 2$ counts, corresponding to 2/3 r.p.m.) and is probably the dominant reason for the spread in Fig. 3. The best logarithmic fit to the data points in Fig. 3 is

$$L_W = 67.1\log(N) + 15.4\ \text{dB(A)} \tag{6}$$

with a correlation coefficient of 0.98. The standard deviation of measurement values with respect to this fit is 1.0 dB.

Table 2
Sound power level of wind turbines [3]

Wind speed v_{10}	m/s	5	6	7	8	9	10
Sound power level L_W	dB(A)	94	96	98	100	102	103

At the specification extremes of 10 and 22 r.p.m. the (individual) wind turbine sound power level L_W is 82.8 and 105.7 dB(A), respectively.

In Table 3 earlier measurement results [3] are given for the octave band sound power spectrum. Also in Table 3 the results of this study are given: the logarithmic average of four different spectra at different rotational speeds. In all cases spectra are scaled, with Eq. (6), to the same sound power level of 103 dB(A).

To calculate sound immission levels at a specific rotational speed (or vice versa) the sound power level given in Eq. (6), and the spectral form in Table 3 ('this study') have been used.

7. Results: sound immission

The sound immission level has been measured with the unmanned SWMS on two locations. Between May 13 and June 22, 2002 it was placed amidst open fields with barren earth and later low vegetation 400 m west of the westernmost row of wind turbines (location A, see Fig. 1). This site was a few metres west of the Dutch–German border, visible as a ditch and a 1.5–2 m high dike. Between June 22 and September 13, 2002 the SWMS was placed on a lawn near a dwelling 1500 m west of the westernmost row (location B), with both low and tall trees in the vicinity. On both locations there were no reflections of turbine sound towards the microphone, except via the ground, and no objects (such as trees) between the turbines and the microphone. Apart from possible wind induced sound in vegetation relevant sound sources are traffic on rather quiet roads, agricultural activities, and birds. As, because of the trees, the correct (potential) wind speed and direction could not be measured on location B, wind measurement data provided by the KNMI were used from their Nieuw Beerta site 10 km to the north. These data fitted well with the measurements on location A.

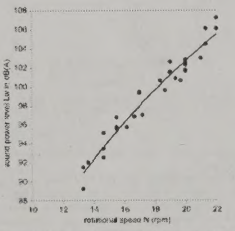

Fig. 3. Measured wind turbine sound power level L_W as a function of turbine rotational speed N.

Table 3
Octave band spectra of wind turbines at $L_W = 103$ dB(A)

Frequency	Hz	63	125	250	500	1000	2000	4000	L_W
This study	dB(A)	82	92	94	98	98	93	88	103
[3]	dB(A)	85	91	95	98	98	92	83	103

At times when the wind turbine sound is dominant, the sound level is relatively constant within 5 min intervals. In Fig. 4 this is demonstrated for two nights. Thus measurement intervals with dominant turbine sound could be selected with a criterion based on a low variation in sound level: $L_5 - L_{95} \leqslant 4$ dB, where L_5 and L_{95} are 5 and 95 percentile sound level. In a normal (Gaussian) distribution this would equal $\sigma \leqslant 1.2$ dB, with σ the standard deviation.

On location A, 400 m from the nearest turbine, the total measurement time was 371 h. For 25% of this time the wind turbine sound was dominant, predominantly at night (72% of all 105 nightly hours) and hardly during daytime (4% of 191 h) (see Table 4).

At location B, 1500 m from the nearest turbine, these percentages were almost halved, but the turbine sound remained dominant for over one-third of the time at night (38% of 312 h). The trend in percentages agrees with complaints mostly concerning noise in the (late) evening and at night and their being more strongly expressed by residents closer to the wind park.

In Fig. 5 the selected (i.e., with dominant wind turbine sound) 5 min equivalent immission sound levels $L_{eq,5\,min}$ are plotted as a function of wind direction (left) and of wind speed (right) at 10 m height, for both location A (above) and B (below). It is not clear why the KNMI wind speed data (used for location B) cluster around integer values of the wind speed.

Also the wind speed at 10 and 2 m height at location A are plotted (in 5A and 5B, respectively), and the local wind speed (influenced by trees) at 10 m at location B (5C). The immission level data points are separated in two classes where the atmosphere was stable or neutral, according to observations of wind speed and cloud cover at Eelde. Eelde is the nearest KNMI site for these observations, but it is 40 km to the west, so not all observations will be valid for the area of the study.

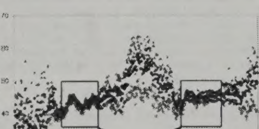

Fig. 4. 48 h registration of immission level (L_5 = ▵; L_{eq} = ●; L_{95} = ○) per 5 min at location A; turbines are considered the dominant sound source if $L_5 - L_{95} \leqslant 4$ dB.

Table 4
Total measurement time in hours and selected time with dominant wind turbine sound

Location	Total time	Night 23:00–6:00	Evening 19:00–23:00	Day 6:00–19:00
A: Total	371	105	75	191
A: Selected	92	76	9	7
	25%	72%	12%	4%
B: Total	1064	312	183	569
B: Selected	136	119	13	4
	13%	38%	7%	0.7%

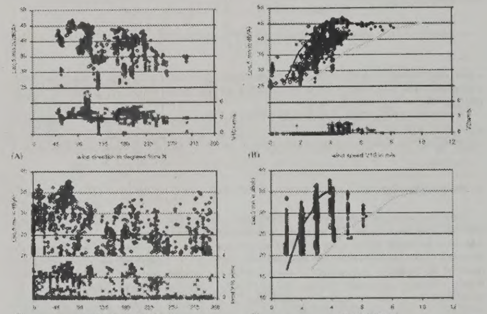

Fig. 5. Measured sound levels $L_{eq,5\,min}$ at locations A (above) and B (below) as a function of median wind direction (left) and average wind speed (right) at reference height (10 m), separated in classes where the atmosphere at Eelde was observed as stable (○) or neutral (●). Also plotted are expected sound levels according to logarithmic wind profile and wind speed at reference height (grey lines in B and D), and at a 2.6 higher wind speed (black lines in B and D). Figures A, B and C also contain the wind speed v_{10} (A), v_2 (B), and the local v_{10} (C) disturbed by trees, respectively.

In Fig. 5B a grey line is plotted connecting calculated sound levels with sound power levels according to Table 2 (the lowest value at 2.5 m/s is extrapolated [12]), implicitly assuming a fixed logarithmic wind profile according to Eq. (2). If this line is compressed in the direction of the abscissa with a factor 2.6, the result is a (black) line coinciding with the highest 1 h values ($L_{eq,1\,h}$) at each wind speed. Apparently, at these immission levels, the wind speed is 2.6 times higher than expected. In Fig. 6 this is given in more detail: all 5 min measurement periods that satisfied the L_5–L_{95}-criterion, with at least 4 periods per hour, were taken together in consecutive hourly periods and the resulting $L_{eq,T}$ (T = 20–60 min) was calculated. These 83 L_{eq}-values are plotted against the average wind speed v_{10} over the same time T. Also plotted in Fig. 6 are: the expected immission levels calculated from (1), implicitly assuming a logarithmic wind profile according to (2), so $f_{log} = 1.4$; the immission levels assuming a stable wind profile (4) with $m = 0.41$, so $f_{stable} = 2.5 = 1.8 \cdot f_{log}$; the maximum immission levels assuming $f_{max} = 3.7 = 2.6 \cdot f_{log}$, in agreement with a wind profile (4) with $m = 0.57$. The best fit of all data points ($L_{eq,T}$) in Fig. 6 with $1 < v_{10} < 5.5$ m/s is $L_{eq,T} = 32 \cdot \log(v_{10}) + 22$ dB (correlation coefficient 0.80); this fit agrees within 0.5 dB with the expected level according to the stable wind profile. The best fit of all 5 min data-points in Fig. 5B yields the same result.

Thus on location A the highest one hour averaged wind speeds at night are 2.6 times the expected values according to the logarithmic wind profile in Eq. (2). As a consequence, sound levels at (during night-time) frequently occurring wind speeds of 3 and 4 m/s are up to 15 dB higher than expected, 15 dB being the vertical distance between the expected and highest 1-h immission levels at 3–4 m/s (upper and lower lines in Figs. 5B and 6).

The same lines as in 5B, but valid for location B, are plotted in Fig. 5D; immission levels here exceed the calculated levels, even if calculated on the basis of a 2.6 higher wind speed at hub height. This is the result of shortcomings of the calculation model for long distances, at least for

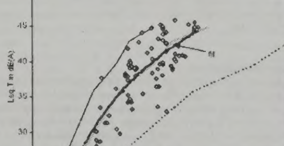

Fig. 6. Measured sound levels $L_{eq,T}$ (T = 20–60 min) at location A with best fit; and expected sound levels according to a logarithmic wind profile ($v_{hub}/v_{10} = f_{log} = 1.4$; dotted line), a stable wind profile ($v_{hub}/v_{10} = 1.8 \cdot f_{log}$; thick grey line) and maximum wind speed ratio ($v_{hub}/v_{10} = 2.6 \cdot f_{log}$; thin line).

night-time conditions: from the long-term measurements at location B and short term (one night) at other locations ([12], not reproduced here) it follows that sound immission levels calculated according to the standard model used in the Netherlands [1], underestimate measured levels at night with ca. 1 dB at distances of 550–1000 m increasing to about 3 dB at distances up to 1900 m.

As is clear from the wind speed at 2 m height plotted in Fig. 5B, there is only a very light wind near the ground even when the turbines rotate at high power. This implies that in a quiet area with low vegetation the ambient sound level may be very low. The contrast between the turbine sound and the ambient sound is therefore higher at night than during the daytime.

Although at most times the wind turbine sound dominates the sound levels in Fig. 5, it is possible that at low sound levels, i.e., at low rotational speeds and low wind speeds, the L_5–L_{95}-criterion is met while the sound level is not entirely determined by the wind turbines. This is certainly the case at levels close to 20 dB(A), the sound level meter noise floor.

The long-term night-time ambient background level, expressed as the 95-percentile (L_{95}) of all measured night-time sound levels on location B, was 23 dB(A) at 3 m/s (v_{10}) and increasing with 3.3 dB/(m s^{-1}) up to v_{10} = 8 m/s [12]. Comparing this predominantly non-turbine background level with the sound levels in Figs. 5B and D, it is clear that the lowest sound levels may not be determined by the wind turbines, but by other ambient sounds (and instrument noise). This wind speed dependent, non-turbine background sound level L_{95} is, however, insignificant with respect to the highest measured levels. Thus, the high sound levels do not include a significant amount of ambient sound not coming from the wind turbines. This has also been verified on a number of evenings and nights by personal observation.

8. Comparison of emission and immission sound levels

From the 30 measurements of the equivalent sound level $L_{eq,T}$ (with T typically 5 min) measured at distance R from the turbine hub (R typically $100\sqrt{2}$ m), a relation between sound power level L_W and rotational speed N of a turbine could be determined: see Eq. (6).

This relation can be compared with the measured immission sound level $L_{eq,T}$ (T = 5 min) at location A, 400 m from the wind park (closest turbine), in 22 cases where the rotational speed was known. These measurements were taken at different times to the emission measurements. The best logarithmic fit for the data points of the immission sound level L_{imm} as a function of rotational speed N is

$$L_{imm} = 57.6\log(N) - 30.6\,\mathrm{dB(A)} \tag{7}$$

with a correlation coefficient of 0.92 and a standard deviation of 1.5 dB. Both relations from Eqs. (6) and (7) and the data points are given in Fig. 7. The difference between both relations is $L_W - L_{imm} = 9.5\log(N) + 46.0$ dB. For the range 14–20 r.p.m., where both series have data points, the average difference is 57.9 dB, the maximum deviation from this average is 0.8 dB (14 r.p.m.: 57.1 dB(A); 20 r.p.m.: 58.6 dB(A); see lower part of Fig. 7). It can be shown by calculation that about half of this deviation can be explained by the variation of sound power spectrum with increasing speed N.

The sound immission level can be calculated using Eq. (1). For location A, assuming all turbines have the same sound power L_W, this leads to $L_W - L_{imm}$ = 58.0 dB. This is independent of sound power level or rotational speed, as it is calculated with a constant spectrum averaged over several turbine conditions, i.e., speeds. The measured difference (57.9 dB) matches very closely the calculated difference (58.0 dB).

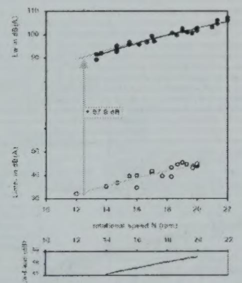

Fig. 7. Turbine sound power levels L_W measured near wind turbines (●) and immission levels L_{imm} measured at 400 m from wind park (○); averages differ 57.9 dB; (below) increase of difference $L_W - L_{imm}$ with rotational speed.

The variation in sound immission level at a specific wind speed v_{10} in Figs. 5B and D is thus seen to correspond to a variation in rotational speed N, which in turn is related to a variation in wind speed at hub height, not to a variation in v_{10}. At location A, N can be calculated from the measured immission level with the help of Eq. (7) or its inverse form $N = 3.4 \times 10^{L_{imm}/57.6}$.

9. Effect of atmospheric stability

In Fig. 5 measurement data have been separated into two sets according to atmospheric stability in Pasquill classes, supplied by KNMI from their measurement site Eelde, 40 km to the west of our measurement site. Although the degree of stability will not always be the same for Eelde and our measurement location, the locations will correlate to a high degree in view of the relatively small distance between them. For night-time conditions 'stable' refers to Pasquill classes E and F (lightly to very stable) and corresponds to $V_{10} \leqslant 5$ m/s and cloud coverage $C \leqslant 50\%$ or $V_{10} \leqslant 3.5$ m/s and $C \leqslant 75\%$, 'neutral' (class D) corresponding to all other situations. Although from Fig. 5 it is clear that the very highest sound levels at an easterly wind (≈80°) do indeed occur

in stable conditions, it is also clear that in neutral conditions too the sound level is higher than expected for most of the time, the expected values corresponding to the grey lines in Figs. 5B and D, derived from daytime conditions. According to this study the sound production, and thus wind speed, at 100 m height is often higher than expected at night, in a stable, but also in a neutral atmosphere. On the other hand, even in stable conditions sound levels may be lower than expected (i.e., below the grey lines), although this rarely occurs. It may be concluded from these measurements that a logarithmic wind profile based only on surface roughness does not apply to the night-time atmosphere in our measurements, not in a stable atmosphere and not always in a neutral atmosphere.

10. Impulsive sound

At night the sound from the wind park contains repetitive pulses, unlike the sound in daytime. According to the long-term auditory observation of residents this pulse-like character or 'thumping', is more pronounced and more annoying at high turbine rotational speed. Fig. 8 shows a recording of the sound pressure level every 50 ms over a 180 s period, taken from a DAT-recording on a summer night (June 3, 0:40 h) on a terrace of a dwelling at 750 m west of the westernmost row of wind turbines (this sound includes the reflection on the façade at 2 m). There is a slow variation of the 'base line' (minimum levels) probably caused by variations in wind speed and atmospheric sound transmission. There is furthermore a variation in dynamic range: a small difference between subsequent maximum and minimum levels of less than 2 dB is alternated by larger differences. In the lower part of Fig. 8 part of the sequence is amplified and shows at first a somewhat irregular pattern of dynamic range 1–1.5 dB leading to a more regular pattern of a pulse every second with a pulse height of 3–4 or 5–6 dB. This pattern is compatible with a complex of three pulse trains with pulse height of about 1 dB and slightly different repetition frequencies of about 1 Hz. When the pulses are out of phase (around 150 s in Fig. 8), there are only 1 dB variations. When 2 of them are in phase (around 160 s) pulse height is doubled (+3 dB), and tripled (+5 dB, 170 s) when all three are in phase. The rotational speed of the turbines at the time was 20 r.p.m., so the repetition rate of blades passing a mast was 1 Hz.

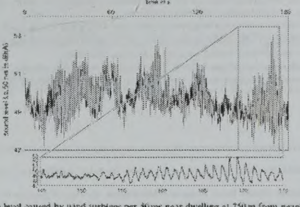

Fig. 8. Sound pressure level caused by wind turbines per 50 ms near dwelling at 750 m from nearest turbine (including reflection at façade at 2 m) over a 3 min period; part of the sequence is amplified below.

The low number of pulse trains, compared to 17 turbines, is compatible with the fact that only a few turbines dominate the sound immission at this location. The calculated immission level is predominantly caused by two wind turbines (numbers 11 and 12: see Fig. 1, contributing 35% of the A-weighted sound energy), less by two others (9 and 14: 21%), so only 4 turbines contribute more than half of the sound immission energy.

A pulse-like character was not expected; e.g., in a recent Dutch report [14] it was stated that wind turbines do not produce impulsive noise. However, when measurements are made at a single turbine, as is usual, no pulses will be audible according to the explanation given above.

11. Annoyance

The immission sound level at location A is for most of the time (at least 72% of night-time hours) higher than expected. At the most frequent night-time wind speeds (v_{10}) of 3 and 4 m/s the sound level is up to 15 dB more than expected. Also at location B, at a considerable distance (1500 m) from the wind park, the immission level is for a considerable amount of time (at least 38% of night-time hours) higher than expected. At location B and at wind speeds of 2–4 m/s the actual sound level is up to 18 dB higher than expected, of which 3 dB are due to limitations of the calculation model, and 15 dB to the underestimate of wind speed at hub height. With these higher sound levels and the impulsive character of the sound more annoyance than predicted is to be expected.

Pedersen et al. [15] have investigated the annoyance around wind turbines in the south of Sweden. Their paper gives preliminary results, and definitive results have yet to published [personal communication Pedersen]. They found highly annoyed residents at (calculated) sound levels as low as 32.5–35 dB(A). This study shows that tall wind turbines may in fact be up to 18 dB noisier than the calculated values suggest. A further increase in annoyance may be expected because of the pulse-like character of the wind turbine noise, especially at high rotational speeds.

12. Conclusions

Sound immission measurements have been made at 400 m (location A) and 1500 m (location B) from the wind park Rhede with 17 tall (98 m hub height), variable speed wind turbines. It is usual in wind turbine noise assessment to calculate immission sound levels assuming wind speeds based on wind speeds v_{10} at reference height (10 m) and a logarithmic wind profile. This study shows that the sound immission level may, at the same wind speed v_{10} at 10 m height, be significantly higher (up to 18 dB) during night-time than in the daytime. Another, 'stable' wind profile predicts a wind speed v_h at hub height 1.8 times higher than expected and agrees excellently with the average measured night-time sound immission levels. Wind speed at hub height may still be higher: at low wind speeds v_{10} up to 4 m/s, the wind speed v_h is at night is up to 2.6 times higher than expected.

Thus, the logarithmic wind profile, depending only on surface roughness and not on atmospheric stability, is not a good predictor for wind profiles at night. Especially for tall wind turbines, estimates of the wind regime at hub height based on the wind speed distribution at 10 m, will lead to an underestimate of the immission sound level at night: at low wind speeds ($v_{10} \leqslant 4$ m/s) the actual sound level will be higher than expected for a significant proportion of time. This is not only the case for a stable atmosphere, but also, to a lesser degree, for a neutral atmosphere.

The change in wind profile at night also results in lower ambient background levels then expected: at night the wind speed near the ground may be lower than expected from the speed at 10 m and a logarithmic wind profile, resulting in low levels of wind induced sound from vegetation. The contrast between wind turbine and ambient sound levels is therefore more pronounced at night.

Measured sound immission levels at 400 m from the nearest wind turbine almost perfectly match (average difference: 0.1 dB) sound levels calculated from measured emission levels near the turbines. From this it may be concluded that both the emission and immission levels could be determined accurately, even though the emission measurements were not quite in agreement with the recommended method. As both levels can be related through a propagation model, it may not be necessary to measure both; the immission measurements can be used to assess immission as well as emission sound levels.

There is, however, a growing discrepancy with distance; at distances of 1–2 km the calculated level may underestimate the measured level by 3 dB. This is most probably a consequence of the fact that the actual (night-time) atmospheric sound transmission is not adequately modelled in the sound transmission model.

At night the turbines cause a low pitched thumping sound superimposed on a broadband 'noisy' sound, the 'thumps' occurring at the rate at which blades pass a turbine tower. It appears that the characteristic, but usually small 'swishing' pulses that can be heard at the rate at which blades pass a turbine tower, coincide because turbines operate nearly synchronously. Two coinciding pulse trains thus give a 3 dB higher pulse level, three a 5 dB higher pulse level. The measured pulse levels and frequencies agree with values expected from nearly synchronous pulse trains generated by a small number of wind turbines.

The number and severity of noise complaints near the wind park are at least in part explained by the two main findings of this study: actual sound levels are considerably higher than predicted, and wind turbines can produce sound with an impulsive character.

The relatively high wind speeds at turbine hub height at night also have a distinct advantage: the electric power output is higher than predicted and benefits the operator of the wind turbine.

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Submission of Comments Related to

EBR - 010 - 6708
EBR-10-6516
Comment ID: 123842

Proposed Ministry of the Environment Regulations to Implement the Green Energy and Green Economy Act, 2009

Submitted By:

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Background:

These comments present the results of a study of three Ontario wind utilities that was conducted to address the question of whether modern upwind industrial wind turbines (IWT) emit infra and low frequency sound (ILFN) as a function of normal operation.

Numerous research papers and other studies have shown that IWT emit acoustical energy across a broad range of frequencies from 0.5Hz to 8000Hz. These studies consistently show that the sound emitted by all makes and models of IWT has its highest magnitudes in the ILFN range. For example, in Figure 1 below a series of 37 modern turbines were studied and their acoustical emissions normalized to 1MW output at a wind speed of 8 m/s. The graph shows the un-weighted sound pressure levels (dBZ SPL) have most of their energy at the frequency range 10-20 Hz. It also shows the same data presented filtered through the A-weighting network (in dBA SPL) which is the more common way IWT sound data is presented in wind industry sponsored reports and studies. This method of presentation may be one reason why the contribution of the ILFN from IWT has been discounted both in studies of annoyance and in health risk assessments. It is also clear from this chart that there is a high degree of similarity between the various makes and models since there are only a few decibels of difference between the maximum and minimums at each frequency. Yet, these facts, which can be found in many technical papers, remain contested by some in the wind energy industry, who take the position that even should there be ILFN emissions, it is not of sufficient amplitude to be audible and thus what low frequency energy that is present is discounted. They often assert that ILFN can only produce harmful effects if it has amplitudes above 80 dB.

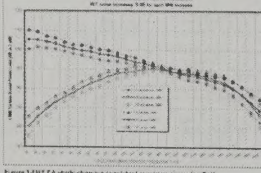

Figure 1-DELTA study showing consistent spectrum shape for IWT

Thus, a study of three wind utilities was conducted during the month of July 2009 to assess the ILFN under normal operating conditions both outside and inside of the homes of people who have reported symptoms of annoyance, sleep disturbance, and body sensations/discomfort related to sensory perception through either their organs of balance (vestibular) as well as auditory perception. Test sites were selected by the Association to

Protect Prince Edward County (APPEC) based on reported health effects linked to the operation of near-by IWT. This selection was directed by Dr. Robert McMurtry and Carmen Krogh, B Pharm (former director of pharmacy with the Edmonton General Hospital).

The study is summarized in the following table:

Wind Utility Description and Summary of Observation Sites					
Utility Name	**Utility Location**	**Utility Capacity**	**Start Date**	**No. of Properties Observed**	**Observed Date(s)**
Erie Shores Wind Farm	East and West of Port Burwell. Study focused on East end of project near Port Rowan and Clear Creek	99 MW 66 GE 1.5sle Wind Turbines	May 23, 2006	2 Occupied Homes 1 Abandoned Home	July 9 to 10, 2009
Melancthon II Wind Plant	Amaranth/Melancthon Twp. (Near Orangeville)	132 MW 88 GE 1.5sle Wind Turbines	Nov. 24, 2008	1 Farm (Sub-Station) 1 Homes 3 Spot Checks	July 10 and 11, 2009
Ripley Wind Power Project	Huron/Kincardine Twp. (Near Ripley)	76 MW 38 ENERCON [illegible] Wind Turbines	Dec. 22, 2007	3 Farms 2 Homes 1 Spot Check (Sub-Station)	July 11, 2009 through July 17, 2009

This study addresses the question of what magnitude of ILFN is present when these adverse health conditions are manifested? The observations reported here-in were made under conditions that produced the health symptoms in the owners or occupants of the selected properties. That is, they were present at the time of the observations. No attempt was made to seek extreme conditions for the observations. Conditions, when confirmed by the property owner or other person(s) at that site as being sufficient to produce the health symptoms, were taken "as-is."

The weather conditions selected for the tests focused on daytime and nighttime periods when the test site was downwind (if possible) of the nearest IWT and when the winds at the ground level (near the microphone) were calm and under 10 km/hr to minimize the contribution of wind induced sounds from vegetation or other surface features. This condition is common in the summer months when solar heating of the earth's surface is reduced either by cloud cover or after sunset[1]. Further, observations were made only in the absence of short term sounds from people, vehicles, or other man-made sounds from sources that would cause confusion as to what component was from the IWT and the other non-IWT sources. Selecting these conditions for testing also minimized ILFN from wind induced sources, such that ILFN, when observed, can be attributed primarily to the sounds emitted by operation of the IWT.

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[1] Schneider, C. P., "Measuring background noise with an attended, mobile survey during nights with stable atmospheric conditions," InterNoise 2009, Ottawa Canada

The intent of making observations under these conditions was to improve the quality of the sampling and also to avoid weather conditions that can caused increased sound emissions from IWT as is common during storms and other high wind conditions, and also during severe winter weather.

Each of the reported observations show the power output of the wind utility for the hour during which the observation was made. This data is from the historical data available at www.ieso.ca/ion.com. Wind speed data is from an anemometer located at ground level near the test instrument which was visually monitored during testing.

LD 831 Sound Level Meter Standards

- IEC 61672-1 Ed. 1.0 (2002-05) Class 1, Group X
- IEC 60651 Ed 1.2 (2001) plus Amendment 1 (1993-02) and Amendment 2 (2000-10) Type 1
- Group X
- IEC 60804 (2000-10) Type 1, Group X
- ANSI S1.4-1983 (R 2006) plus Amendment S1.4A-1985 (R 2006) Type 1
- ANSI S1.43-1997 (R 2007) Type 1
- **Octave Filter Standards (Option 831-OB3)**
- IEC 61260 Ed. 1.0 (1995-08) plus Amendment 1 (2001-09), 1/1 and 1/3 Octave Bands, Class 0
- Group X, all filters
- ANSI S1.11-2004 Class 1

Frequency Range

1/1 Octave filters: 8 Hz to 16 kHz

1/3 Octave Filters: 6.3 Hz to 20 kHz

The 1/1 and 1/3 octave filters (Option 831-OB3) comply with all requirements of IEC 61260 Ed 1.0 (1995-08) including amendment 1 (2001-09) for Class 0 and all requirements of ANSI S1.11-2004 for Class 1. Sampled at a rate of 51,200 samples per second [illegible] real time performance for all filters.

Testing was done using a Larson Davis Model 831 Precision (Type 1) Integrating Sound Level Meter as shown in the box to the right. The instrument was mounted on a tripod, calibrated before and after each series of observations, and programmed to collect an audio sample for each measurement period to provide a means of confirming that the sample was not contaminated with wind-induced pseudo-noise or other noise sources other than the IWT sounds of interest. When the audio sample or field notes indicated that the sample was contaminated, that sample was eliminated from the data. Only "clean" samples of IWT sounds are presented as part of this report.

Thus, what this study provides is data representative of the long term, low level sounds from IWT that are present when susceptible people are experiencing adverse health effects.

This study is, of necessity of time and resources, limited in its scope. However, all efforts have been made to present information that is of value in demonstrating that adverse health effects can be triggered in a susceptible minority of people by ILFN at SPLs that are below the threshold of audibility. This study should be used to establish the need for an properly funded and independent low frequency and infrasound measurement project to further establish the link between adverse health effects and sound emissions from industrial wind turbines.

In spite of claims from some people associated with the wind energy industry there is an ever growing body of evidence linking ILFN with medical problems. These studies are by medical professionals and not by acoustical engineers and others without medical training and credentials. It is expected that this evidence will continue to mount and also to be published as peer reviewed medical research into the mechanisms linking IWT emissions with adverse health effects, such as Vibro Acoustic Disease, Wind Turbine Syndrome, and the well established health effects caused by sleep disturbance.

Summary of Comments:

These comments are based on the material provided in the following Ministry of the Environment Publications.

1 Proposed Content for the Renewable Energy Approval Regulation Under the Environmental Protection Act – 24 pages of notes dated June 9, 2009. "Proposed Content"

2 Noise Guidelines for Wind Farms – 18 pages dated October 2008. "Noise Guidelines"

1. Sounds Observed Outside Homes

Observations at locations exterior to homes were generally taken either at the property line closest to nearby IWT or at a location used for peaceful enjoyment of that property. The graphs shown in Appendix A provide the location of the observation site and the power output of the IWT utility at the time of the observation.

The SPLs are shown without the use of A or C weighting, but, in some cases also show the over-all dBA and dBC sound levels for the observation period. This format makes the consistent dominance of the ILFN emitted by the IWT visually clear. Comparison of the various graphs in Appendix A shows that there is little difference in the shape of the spectrum between any of the subject utilities. This supports the general observation of spectrum shape shown in the Delta study in Figure 1. Differences between the over-all dBA and dBC sound levels is approximately 15 dB which is another indicator that the use of only dBA as a criteria for siting IWT is not sufficient. ILFN must be taken into consideration when establishing rules limiting noise from wind utilities since ILFN carries further than does sound in the mid and high frequency ranges.

It is also demonstrated that this spectrum shape is present even during periods with low power output from the IWT utility. Weather conditions that would lead to higher power output, such as cold, dense winter air and higher wind speeds would be expected to increase these levels. It also demonstrates why the use of dBA criteria is not appropriate for evaluating wind turbine noise. For readers versed in acoustical engineering concepts, examination of the graph (bottom of first page of Appendix A) showing sound from IWT 700 meters away from a property in the Erie Shores Wind Project where the dBA and dBC values are approximately 15 dB apart it is easy to see that if one was to exclude from the calculation of the dBA value all data from 500 Hz (B5 on a piano and the point where the A-weighting begins to affect the decibel level), the resulting calculated dBA value would not differ greatly from the observed dBA value. This 'mental exercise' should make it clear that using dBA filtered measurements to describe and control IWT sounds is absurd. This is one major reason why projects that appeared to be compatible with communities experience numerous complaints or worse once constructed and operating. IWT should be described in a more complex manner that needs dBC and quite possibly octave band SPLs to address their unique spectral characteristics. This will be addressed later in more detail.

Two graphs in Appendix A also show the tones from a substation. One is on the top of the second page ("Audible Hum' from Melancthon II Wind…") and the second is the bottom of the third page ("Across Road from Ripley Wind Sub-Station"). These are presented as bar charts to more clearly show the presence of 60 cycle tones produced by the substation equipment. Tones should not be filtered through the process of establishing prominence as is currently done in MOE rules. Tones, when audible, are a serious cause of annoyance and because tones can often be discerned in quiet environments at great distances and even when they have a lower sound level than other sounds in the soundscape. Although there are several methods for estimating the audibility of tones, it is not necessary once the project is constructed and operating. If a tone can be heard, that should be sufficient proof of its existence. It should not need a complex method of measurement to "verify" its existence.

Tones are a known source of annoyance and because of the auditory system's ability to hear tones in the presence of other sounds they should be forbidden as a basic element of any siting rules. This may appear to be extreme, but the nature of these type of problem is not a mystery, it is preventable with proper design.

When considering tones from 60 cycle hum in components in a substation there are two straight forward solutions. First, the equipment used in the substation should be selected based on the absence of tones from manufacturer's laboratory grade test data. Equipment that the developer knows produces a tone should not be installed. If the tones are present when the equipment is installed it indicates a malfunction and the equipment should be replaced. If existing substations have complaints about tones and the equipment is known to produce tones during normal function then, either the equipment should be swapped out for quiet alternatives, or the sub-station should be ringed with a high wall constructed either of acoustically tuned concrete blocks (e.g. Proudfoot's SoundBlox™) or acoustical walls with similar design features. The height of the wall must be sufficient to block the tone from all nearby occupied properties or other sensitive receivers and care must be taken to prevent sounds from escaping through breaks in the wall needed for access to the substation. If necessary, the substation may need to be totally enclosed (walls and a ceiling with acoustical louvers or forced air ventilation to prevent heat buildup.

That two of the three wind utilities exhibit these tones (even after a wall and earthen berm was installed for one of them) should be considered an indication of failure to properly address known sources of complaints in a timely manner.

2. Sounds Observed Inside Homes

Appendix B presents three graphs showing the sounds that are present inside homes that can clearly correlated to the sounds of the IWT outside the home. The graphs follow a similar format as for outdoor sounds in Appendix A. The point of observation was selected to be in the bedroom where sleep disturbance and other adverse health effects were reported at the approximate location of the sleeping person's head. In all cases, windows were fully open as was the practice for these families. This researcher, who is accustomed to suburban living with closed windows, stayed overnight at two of the homes in the study areas for personal experience. This personal test confirmed that the sounds from the IWT are clearly audible during the nighttime hours as distinct from nature sounds in rooms with open windows under less than full power production conditions. Periods when the blade swish increased in loudness (clarity and amplitude) resulted in being awakened even if only for a brief time. This supports the need to consider blade swish (amplitude modulation) and its effects on annoyance and sleep disturbance in siting criteria. Often this is addressed by adding a 5 dB penalty to criteria; or, if the amplitude modulation is considered potentially present for all wind turbine makes and models, the penalty can be incorporated into the criteria. However, in order to encourage attention to this problem by wind turbine manufacturer's in future designs, it is useful to have it as a separate penalty.

Again, like for tones, this should not devolve into a technical argument of what constitutes sufficient fluctuations to be deemed blade swish for purposes of assessing the penalty. If it is audible, it is likely that there is at least 3-5 dB of amplitude modulation and that is sufficient to cause annoyance and sleep disturbance. It is the personal experience of this researcher that under some conditions the blade swish can rise to levels of 6 to 11 dB above the broadband sounds emitted by the IWT.

The graphs in Appendix B show the average sound levels in each frequency band and thus do not demonstrate the amplitude modulation. However, blade swish was present in at least 50% of the observed samples, generally in the range of 3 to 5 dB above the steady broadband sounds.

Inspection of the graphs shows that the same basic spectrum shape occurs inside as it does outside. The amplitudes are slightly lower, but not much more than about 5 dBA. Whereas, the sound levels outside where between 40 and 45 dBA, inside they are 35 and 40 dBA. dBC values are only slightly lower inside, which is to be expected given the dominance of low frequency energy which is not blocked to any great extent by homes built using modern wood frame designs. Given that the World Health Organization recommends that bedrooms be no more than 30 dBA without amplitude fluctuations or excessive low frequency sound energy, it is clear that the three wind utilities included in this study are above the WHO criteria for preventing sleep disturbance and its associated adverse health effects. This should be a strong encouragement to the MOE to re-examine its choice of 40 dBA as the appropriate siting level for properties adjacent to IWTs. IWTs produce sound levels above 30 dBA, have amplitude modulation (an outdoor dripping faucet) and dominant acoustical energy in the lowest frequencies. This shows that IWT's fail all three tests for compatibility with nighttime operation in areas where people are in homes attempting to rest during the night.

3. Appropriate Sound limits

There is much discussion about what sound levels should be used for siting IWT to avoid the problems commonly associated with their nighttime operation. This issue is of importance in Ontario as it is in other places where wind turbine development is ongoing. A case in point is in the State of New York, where wind developers often promote 50 dBA as being acceptable for quiet rural communities of the type studied in this research. A presentation presented to the agency in New York responsible for promoting wind energy development by Mr. Dan Driscoll, (retired former noise engineer for New York's Department of Environmental Control's Noise Bureau and later New York's Dept. of Public Service addresses this issue in a clear manner. A copy of his presentation is included in Appendix C for review. Mr. Driscoll was involved in siting many utilities during his career and understands the complex issues involved in establishing noise criteria from personal experience. In his presentation he demonstrates that the appropriate sound level limit should be 33 dBA assuming nighttime operation of the IWT. He states:

> "In the noise control profession it is generally considered adequate to reduce expected community response to "sporadic complaints," assuming that most of these complainants are using noise as a surrogate for visual impact or general dislike of the noise source. So, if the Normalized Ldn could be reduced to about 59 dBA (see Figure D-7) the community reaction would be acceptable. Working back through the normalization process gives an Ldn of 39 dBA. Therefore, the Leq of the hypothetical wind turbine should be 33 dBA; a setback of about 3000 feet or 1 kilometer would achieve that."

This should be a serious consideration for the MOE in its criteria. This method does not make special rules for wind turbines, it merely applies long standing methods to the specific characteristics of wind turbine noise to develop the noise limits.

Oerlemans, S. and Schepers, G. "Prediction of wind turbine noise directivity and swish" presented at the Third International Meeting on Wind Turbine Noise, Aalborg, Denmark, June 17-19, 2009 and
Palmer, P.Eng., K.G., "A New Explanation for Wind Turbine Whoosh- Wind Shear" also presented at the same conference.

3. Appropriate Spectral Shape Characteristics

It is easy to see wind turbines as a special case of industrial machinery. However, to people with experience in the design of heating and cooling systems for large offices and other complexes a wind turbine is just a large fan. There is a specialty field that addresses the proper acoustical design inside buildings that can offer useful insights into how to characterize wind turbine sounds inside rooms and also how to establish rules that promote the design of future wind turbines to be more compatible with living spaces. That group is the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). Do to the nature of their field, they have developed tools for rating room interiors in the presence of rumble from ILFN as well as other characteristics of large fans. Appendix D includes information on the RC Mark II rating scheme used for analyzing spectral content of living spaces. It is suggested that this information be considered in developing siting criteria based on long standing scientific work of the ASHRAE engineers.

Included in the Appendix D information is a paper prepared by Warren E. Blazier, Jr. and Charles E. Ebbing addressing their research into this field. Mr. Ebbing (now retired) was sent a spectrum representing IWT noise in a home interior (window open) for analysis of the room's characteristics. His response was:

> "I see that it (the example room data) is RC 23, QAI rating>10 and has a LF spectrum index of 7. So you have a bad rumble situation in this example. You are in the A region with a high probability that noise induced vibration levels in light wall and ceiling structures will be noticeable. Rattling of lightweight light fixtures, doors and windows should be anticipated. Since you are 5 dB into the A region I would not be surprised if you felt your light lungs vibrating."

Thus, the experience of many who complain of body vibrations or other effects of ILFN is supported by the methods used to diagnose problems with large fans in office and other large buildings. This should be a strong signal for those who have made light of these complaints in the past, thinking that they are the product of people's imaginations or other causes not related to the actual sound environment in which they now live when the IWT is operating.

3. Final Comments

This report has demonstrated that ILFN is both a common characteristic of IWT sound emissions and present when people are experiencing adverse health effects or sleep disturbance. It also demonstrates the need for a more complex rating method that the use of dBA criteria. It shows that to reduce complaints to the level of 'sporadic' it is necessary to limit sound immissions at homes near IWT to 35 dBA or less. It also demonstrates that there is a scientific basis for supporting the complaints from people living near IWT about rumble and perceived body vibration using methods that have been in use for years in the heating and cooling industry. Together, these findings should be sufficient to support a complete re-thinking of the approach to be used in establishing siting criteria for wind turbine utilities under the Green Energy Act.

Finally, it should be noted that there is an absence of any emphasis on using Best Available Technology to address the problems noted here-in and elsewhere. The manufacturer and users of wind turbines should be given encouragement through MOE's rules to use not only the quietest IWT's available on the market today but also to push for quieter designs in the future. There appears to be a belief that bigger is better in this industry. There is talk now of 8 MW wind turbine for onland installation from some manufacturers. The criteria being established now should challenge that belief by encouraging quieter, more efficient designs instead of just large. It is quite possible that the best future for renewable wind energy in Ontario is not to acquiesce to the urge for bigger machines but, instead to promote the use of smaller wind turbines that may be more compatible with installation in quiet rural areas with people required to live amongst what is, for all practical purposes, really an industrial zone.

Dated: July 24, 2009

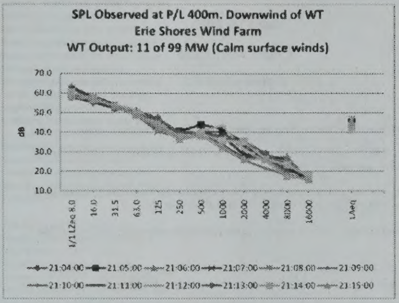
Richard R. James

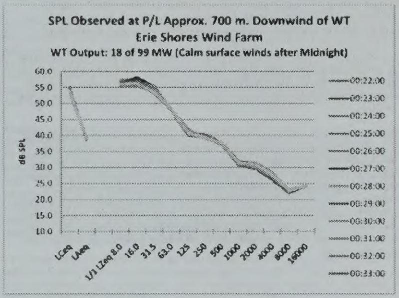
Richard R. James, INCE
E-Coustic Solutions

Appendix

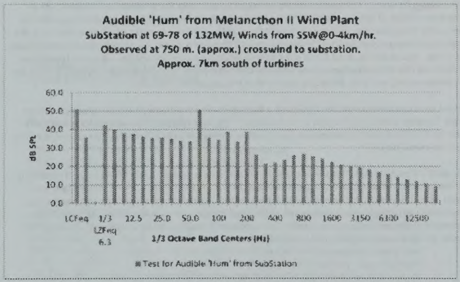
Number	Contents
A	Exterior Sound Pressure Levels at Selected Properties
B	Interior Sound Pressure Levels at Selected Homes
C	Daniel A. Driscoll's response to the questions about noise to the Environmental Stakeholder Roundtable on Wind Power, June 16, 2009, Empire State Plaza, New York
D	RC Mark II methods for assessing spectral characteristics of rooms. Criteria for Low-Frequency HVAC System Noise Control in Buildings (Blazier and Ebbing) and excerpt from ASHRAE Applications Handbook (2003 edition)
E	Kamperman/James, "The "How To" Guide To Siting Wind Turbines To Prevent Health Risks From Sound" Version 2.1, October 2008
F	Biographical information on Richard R. James, INCE

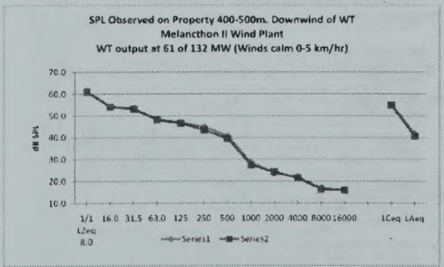
APPENDIX A
Observation of Exterior Sound Pressure Levels at Selected Properties


SPL Observed at P/L 400m. Downwind of WT
Erie Shores Wind Farm
WT Output: 11 of 99 MW (Calm surface winds)

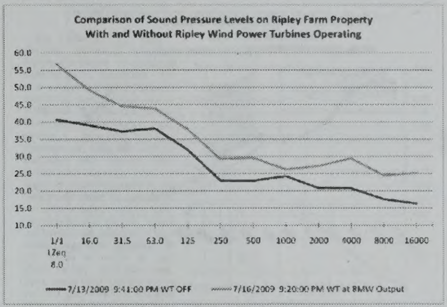

SPL Observed at P/L Approx. 700 m. Downwind of WT
Erie Shores Wind Farm
WT Output: 18 of 99 MW (Calm surface winds after Midnight)

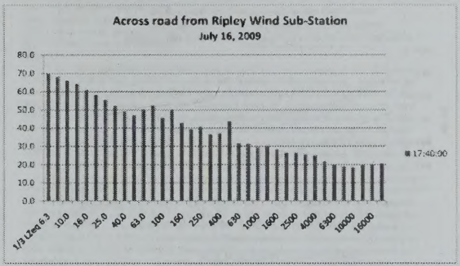
APPENDIX A
Observation of Exterior Sound Pressure Levels at Selected Properties


Audible 'Hum' from Melancthon II Wind Plant
SubStation at 69-78 of 132MW, Winds from SSW@0-4km/hr.
Observed at 750 m. (approx.) crosswind to substation.
Approx. 7km south of turbines

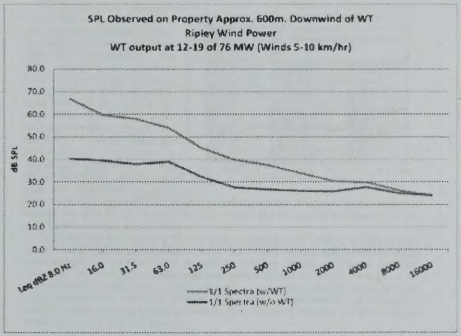

SPL Observed on Property 400-500m. Downwind of WT
Melancthon II Wind Plant
WT output at 61 of 132 MW (Winds calm 0-5 km/hr)

APPENDIX A
Observation of Exterior Sound Pressure Levels at Selected Properties


Comparison of Sound Pressure Levels on Ripley Farm Property
With and Without Ripley Wind Power Turbines Operating

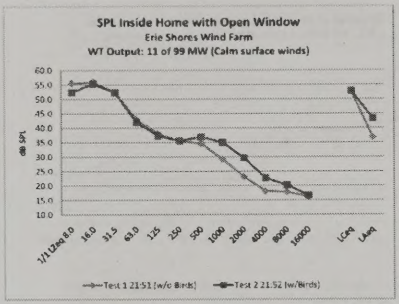

Across road from Ripley Wind Sub-Station
July 16, 2009

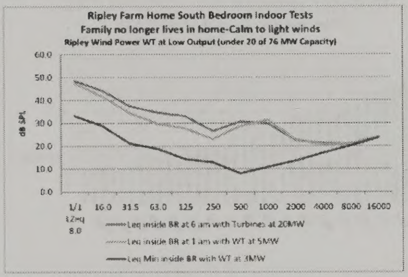
APPENDIX A
Observation of Exterior Sound Pressure Levels at Selected Properties


SPL Observed on Property Approx. 600m. Downwind of WT
Ripley Wind Power
WT output at 12-19 of 76 MW (Winds 5-10 km/hr)

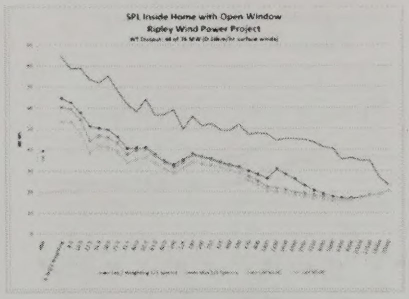
Comment Letter P170

Appendix B
Graphs of Observed Interior Sound Pressure Levels





Appendix B
Graphs of Observed Interior Sound Pressure Levels



APPENDIX C

Environmental Stakeholder Roundtable on Wind Power

June 16, 2009

Empire State Plaza

Meeting Room 1

Environmental Discussion – Daniel A. Driscoll's response to the questions about noise:

> **Question 1.** What research has justified the choice of 50 dBA as an appropriate noise criterion, particularly for rural areas of the state?
>
> **Question 2.** Have studies been done in New York that identify the low frequency sounds (infra sound) from wind turbines, and their effects on humans and animals?

Before responding to the questions, it will help to give a brief explanation about how noise can be regulated.

1. Most town zoning ordinances prohibit "excessive" noise. While suitable for neighbor to neighbor disputes, the prohibition is vague and may not be enforceable in court.

2. Control how the noise source is operated, for example, distance (setback) from residences or property lines, hours of operation, wind speed, etc. This method is very effective and easy for towns to enforce, but it does not account for possible changes in wind turbine technology. Developers have proposed 500 and 1000 foot setbacks: towns are beginning to discover that setbacks on the order of 3000 feet or more are needed for industrial-scale wind turbines.

3. Specify a numerical noise limit. This allows for changes in wind turbine technology, but towns must hire qualified noise control engineers to help with creation and enforcement of the limit. Characterizing the sound produced by the wind turbine in a way that adequately protects the community is complex and also requires the assistance of a qualified professional to verify the applicant's data.

4. Limiting the permissible increase in sound level above the background sound level is the most accurate way to control community noise and is the method recommended in DEC's noise policy. But in addition to the complexities related to setting and enforcing a noise limit, the background sound level must be measured in a way that adequately protects the community. To characterize the background sound level in quiet suburban and rural communities, the commonly used Leq can be misleading; the L90, or residual sound level more accurately reflects the community's baseline for judging the intrusiveness of a new noise source. The Noise-Con 2008 paper by Kamperman and James (Simple Guidelines for Siting Wind Turbines to Prevent Health Risks) describes this method of noise control and includes guidelines for measuring the background sound level.

APPENDIX C

Response to Question 1. One basis for a 50 dBA noise limit is the EPA's well-known publication, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, commonly known as the Levels Document, www.nonoise.org/epa.htm. In the Levels Document, the EPA uses the day/night sound level (Ldn) as a measure of noise; the Ldn is the sound level energy-averaged over 24-hours with a 10 dB penalty added to nighttime sound levels (10 pm to 7 am). Hypothetically, if a 2.5 MW wind turbine produced a constant energy-equivalent sound level (Leq) of 49 dBA at 500 feet (complying with a 50 dBA noise limit), its Ldn would be 55 dBA. (The Ldn for a constant sound source is about 6 dB greater than the Leq for that source.)

Based on extensive research, the EPA chose a day/night sound level (Ldn) of 55 dBA to protect people from "outdoor activity interference and annoyance." The limit applies to "residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use."

Figure D-7 from the Levels Document shows expected community reaction to noise; the dots represent different studies of various noise sources. It shows that there would be no community reaction to a noise with an Ldn of 55 dBA, although the noise would be generally noticeable. However, notice that horizontal axis in the Figure uses Normalized Ldn. Assuming an urban residential location, some prior exposure to the noise source, windows partially open, and no pure tone or impulsive character to the noise, the Normalized Ldn and the Ldn are the same.

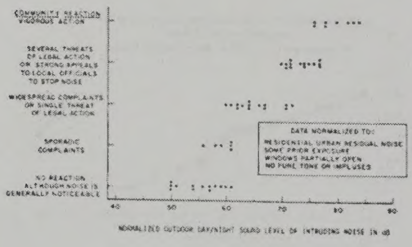
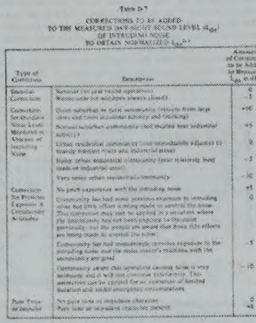


Figure D-7. Community Reaction to Intensive Noises of Many Types as a Function of the Normalized Outdoor Day Night Sound Level of the Intruding Noise D-3

Table D-7 shows the normalization process. If the noise source having an Ldn of 55 dBA were operated in a quiet suburban or rural community having no prior experience with the noise source, and if the noise source has a pure tone or impulsive character (an appropriate correction for the modulated low-frequency sound of industrial-scale wind turbines), the Normalized Ldn would be 75 dBA. From Figure D-7, the expected community response under those circumstances would be "several threats of legal action or strong appeals to local officials to stop [the] noise."



This discussion is intended to illustrate the expected community response to noise; it is not a recommendation that Ldn or Normalized Ldn be used to regulate wind turbine noise. For noise sources that may change throughout the day, a long term average sound level (such as Ldn) can be misleading by averaging periods of relative quiet with periods of maximum noise.

What should be done? In the noise control profession it is generally considered adequate to reduce expected community response to "sporadic complaints" assuming that most of those complainants are using noise as a surrogate for visual impact or general dislike of the noise source. So, if the Normalized Ldn could be reduced to about 59 dBA (see Figure D-7) the community reaction would be acceptable. Working back through the normalization process gives an Ldn of 39 dBA. Therefore, the Leq of the hypothetical wind turbine should be 33 dBA; a setback of about 3000 feet or 1 kilometer would achieve that. It should be noted that this result is consistent with the Kamperman/James paper.

Response to Question 2. I am not aware of any research in New York State dealing with the effects of low-frequency sound (20 – 200 Hz) or infrasound (below 20 Hz) on humans or animals. However there are extensive interviews and first-person reports, available on the internet and elsewhere, from people living near industrial-scale wind turbines in New York describing their experiences with the wind turbine noise. The reports I have read are generally consistent with the known effects of low-frequency sound and infrasound. For example, the sound is often more noticeable indoors; the sound is occasionally felt in the chest rather than heard; and the effects can be a mixture of sleep interference, headache, dizziness, nausea, etc. A similar situation is found in some urban apartment buildings where low frequency traffic noise resonates in stairwells and hallways.

What should be done? When low-frequency noise or infrasound is a concern it is advisable to control both A-weighted sound levels (which emphasize speech frequencies) and C-weighted sound levels (which include more low frequencies). The C-weighted measurement should not exceed the A-weighted measurement by more than 20 dB.

CRITERIA FOR LOW-FREQUENCY HVAC SYSTEM NOISE CONTROL IN BUILDINGS

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Until the late 1970s, noise control problems with HVAC systems were typically concentrated in two regions of the frequency spectrum. The first was in the mid-low frequency range, in the region of 250 Hz. The source typically was associated with *central-station* air handling equipment, and the audibility of the fan blade-passage frequency was a common problem. The second region was in the mid-high frequency range between 500 and 2000 Hz, usually attributable to noise radiation from high-velocity ductwork, or the regenerated noise of air terminal devices such as diffusers, registers, and grilles. For these types of problems, noise criteria such as NC curves[1] and A-weighted sound level were useful metrics, either for assessing the magnitude of a problem or to establish noise control requirements.

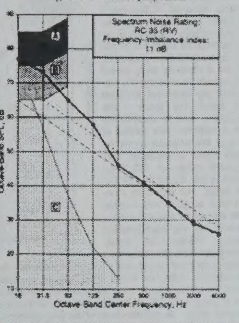
However, in the 1980s two things happened that dramatically changed the type of noise problems encountered in typical new construction. The first factor was the introduction of new energy regulations which mandated *variable* rather than constant volume air distribution design. The second, was a new trend away from the use of *built-up* central-station fan equipment — in favor of *local*, floor-by-floor or roof-top, *packaged* air handling equipment. As the result, today's HVAC noise problems are not confined to just the "roar" and "hiss" of the past, but have acquired the *new* dimensions of intense low-frequency rumble and of time-modulation. Indeed, a majority of current noise problems in contemporary buildings occur in the frequency range *well below* 250 Hz. A large fraction of these are a result of dominant sound pressure levels in the 12 - 40 Hz region! Another complication is that the high frequency sound pressure levels produced by present-day air terminal devices in many applications are significantly lower than in the past, principally as a byproduct of the mandated variable air-volume design. This factor, combined with a substantial increase in the level of low-frequency sound from the rest of the system, tends to produce a *non-neutral*, time-modulated, rumbly-sounding background noise that many people find objectionable.

The A-weighted sound level is a meaningless metric for dealing with this new class of problems, because the low frequency spectrum is much too heavily weighted. NC curves do not extend low enough in frequency to address the region of the spectrum responsible for a high percentage of the complaints. However, a diagnostic procedure using the RC curves and rating methodology[2] appears promising as one basis for identifying problems with low-frequency noise, and in establishing guidelines for noise control design. Although, the octave-band RC procedure does not adequately resolve problems with narrow-band or tonal components in the spectrum — and only indirectly addresses problems associated with time-modulation, the present method *does* reliably identify potential problems with frequency-imbalanced spectra which are likely to cause complaints.

RC PROCEDURE FOR LOW-FREQUENCY NOISE RATING

Fig. 1 illustrates the "rumbly" spectrum encountered beneath a typical installation of packaged roof-top HVAC equipment. The data were obtained from measurements in an executive office/conference room located directly below the main ductwork of a unit serving a three-story building. Although the occupants had *no* difficulty with speech communication, they were most unhappy because the *quality* of the background sound was oppressive and objectionably rumbly, lighting fixtures and pictures rattled and buzzed, and the fact that concentric rings were noticeable on the surface of coffee in cups placed on the conference table. Since the HVAC installation on the roof was correctly vibration isolated from the building structure, it was apparent that the problems observed were *airborne* in origin, and mostly attributable to noise radiated from the overhead ductwork.

Fig. 1
Typical HVAC "Rumbly" Spectrum

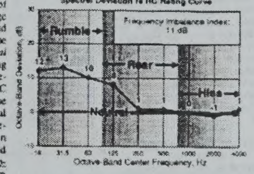


The measured spectrum had a sound level of 46 dB(A) and a rating of NC 42 — neither of which was high enough to explain the reaction of the occupants. However, an analysis using the current RC methodology yielded a rating of RC 35 (RV). This RC rating revealed three things: First, the numerical level of 35 meant that the three-band speech interference level (PSIL) was 35 dB, which is acceptable for good speech communication in most rooms of the size encountered; second, that the *quality* of the background sound was in the "rumbly" (R) category; and third, that the intensity of low-frequency noise was great enough to vibrate or rattle lightweight surfaces. Thus, this rating correlated well with what was observed about the characteristics of the environment.

A further step in the diagnostic process was to determine the extent of noise reduction necessary, and where in the spectrum, to obtain a worthwhile improvement *from the viewpoint of the occupant*. One method is to observe the extent to which the low-frequency spectrum (16 Hz - 125 Hz) lies *above* the RC rating curve, which is established by the value of the PSIL. For example, the basic RC rating methodology does not permit deviations greater than 5 dB *above* the curve in this low frequency region, if an (R) rating is to be avoided. Thus, the *minimum* noise reduction requirements are those that ensure this restriction is not violated. However, a more precise method of establishing the low-frequency noise control requirements is based on a calculation of the "frequency-imbalance index" of the spectrum, *with respect to an RC curve*. This index can provide a useful indication of the extent to which deviations from the shape of an RC curve likely affect the *subjective* perception of a neutral-sounding spectrum. (Implicit in this method is the premise that a -5 dB/octave slope results in a *frequency-balanced*, neutral-sounding spectrum).

To calculate this imbalance-index, first compute the PSIL of the spectrum (arithmetic average of the levels in the 500, 1000 and 2000 Hz octave-bands). The PSIL identifies the *numerical* level of the relevant RC rating curve. Next, subtract the octave-band levels of the relevant RC curve from those of the noise spectrum, to derive the spectral deviations. Then, sum these deviations on an *energy* basis in two groups, 16 Hz to 250 Hz and 250 Hz to 4000 Hz. Finally, subtract the high-frequency sum from the low-frequency sum to obtain the imbalance-index. The index computed in this manner for the noise spectrum of Fig. 1 is +11 dB, and the spectral deviations from the relevant RC curve are shown in Fig. 2.

Fig. 2
Spectral Deviation re RC Rating Curve



Initial experience in applying this index in the prediction of subjective response suggests that the magnitude of imbalance, after noise reduction measures have been taken, must be less than 5 dB to satisfy an occupant who has *already* complained about the "rumble". However, the magnitude of imbalance sufficient to "trigger" a negative response from occupants, *with no prior exposure*, is much less predictable, because of the wide variability in individual attitudes about noise. (Incidentally, the frequency-imbalance index can also be used to identify "hissy-sounding" spectra; however, the sign of the index value will be negative).

NCB PROCEDURE FOR LOW-FREQUENCY NOISE RATING

Recently Beranek published a set of noise criteria called the NCB curves[3]. These new curves embody revisions to the shape of the earlier NC curves, extend the frequency range downward to include the 16 and 31.5 Hz octave-bands, and prescribe rules by which noise spectra may be evaluated or rated. The shape of any given NCB contour, by definition, represents a spectrum that is "balanced" by virtue of the *relative loudness* in each octave-band being equal. Additionally, the difference between the calculated loudness level (Stevens Mk. VII) of each criterion curve and its four-band speech interference level (SIL) is approximately 24 units, a postulate based on conclusions reached in Beranek's earlier research in the development of NC curves.

Aside from the fact that the NCB criteria are specified for *occupied* spaces, that include activity noise — which creates some real problems in application to HVAC specifications, considerable concern has been expressed about the permissiveness of the contours in the 16 and 31.5 Hz octave-bands. The principal argument is that permissible levels in this frequency region, for even moderate criteria such as NCB 30-35, are sufficient to induce feelable vibration in lightweight building construction materials, which in turn can cause secondary noises such as rattles, ticks etc. to be generated. Although this potential problem is recognized by warning flags contained in the evaluation procedure, the reality is that virtually *all* contemporary building structures use lightweight materials for interior finishes, and are thus susceptible to the problem of rattles and ticks.

Fig. 3
NCB Rating of Spectrum in Figure 1

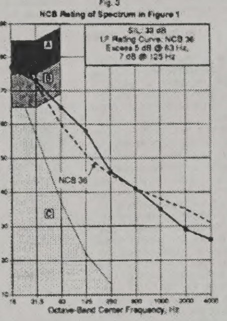


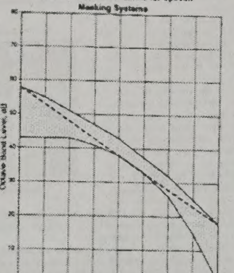
Fig. 3 illustrates the use of the NCB procedure to evaluate the spectrum illustrated previously in Fig. 1. Since the calculated SIL of the spectrum is 33 dB, the low-frequency evaluation, according to the instructions, is based on deviations above an NCB curve 3 dB higher, or NCB 36. Note that the unacceptable deviations in excess of NCB 36 are in the 63 and 125 Hz octave-bands, suggesting that this is where the noise control effort should be concentrated (neglecting any additional problems with rattles and ticks). Unfortunately, there is considerable field experience with spectra of this type that indicates people seriously object to excessive low-frequency energy of such magnitudes in the 16 and 31.5 Hz octave bands, and that such problems must be *dealt* with — even in the absence of rattles and ticks. Consequently, one must seriously question whether an equal-loudness per band criterion, over a frequency range this broad, really is appropriate for low-frequency noise assessment.

In fairness, in the late 1950s, when Beranek developed his original hypothesis concerning the relationship between loudness level and speech interference level, HVAC systems of that era did not produce the preponderance of low-frequency noise which is experienced today. At that time most of the noise problems in HVAC systems were in the "roar" and "hiss" categories, and it is quite likely that conclusions reached on the basis of these early studies were valid for the source characteristics encountered. Certainly, the long period of successful use of NC curves as criteria should be recognized.

SPECTRUM SHAPE VS. SUBJECTIVE TOLERANCE

Many empirical data exist that reveal what people apparently will or will not tolerate in a background noise spectrum utilized for sound masking applications in open-plan offices. Fig. 4 illustrates the field experience of the staff at Bolt Beranek and Newman; wherein, noise spectra lying within the boundaries of the shaded region are believed to create an acceptably neutral-sounding background environment[4]. (The ordinate of the graph has been chosen at an arbitrary level, but within the range of typical applications). For comparison, a dashed line is also shown having a slope of -5 dB/octave, corresponding to the shape of RC curves which were derived from studies of 65 office environments with HVAC background noise of acceptable subjective *quality*[5]. The *upper* boundary of the shaded area illustrates the low and high-frequency limits found necessary to avoid subjective criticism as being too "rumbly" or too "hissy". Two considerations established the *lower* boundaries of the shaded region: First, to avoid "coloration" of the sound in the mid-frequency direction, a certain *minimum* level of low-frequency energy is needed. Second, to maintain speech-masking effectiveness, the extent to which the high-frequency content of the spectrum may be suppressed is also limited. From this experience with sound-masking systems in offices, it is apparent that people react *unfavorably* to background noise that contains *noticeable* energy at either the very low or very high ends of the frequency spectrum. The experience also suggests that a spectrum with the shape of an RC curve is a better approximation of a *neutral* background sound, than one having the shape of an NCB curve.

Fig. 4
Acceptable Spectrum Limits for Speech Masking Systems



QUASI-PERIODIC OR RANDOM TEMPORAL FLUCTUATIONS

Virtually all the criteria in present use for HVAC noise evaluation were initially qualified by the caveat, "application is limited to *steady-state* noises exhibiting no large temporal fluctuations in level". Unfortunately, it is common practice to ignore this caveat and record either an eyeball-averaged or an Leq value of the signal, independently of the fluctuations.

If the temporal fluctuations are only on the order of a few dB, serious errors do not usually result by application of steady-state noise criteria. However, more and more problems are being identified with excessive levels in the 16 and 31.5 Hz octave-bands, where the amplitude fluctuations of the signal can be huge (>15 dB), and serious errors can be made in the prediction of subjective response based on eyeball averages or Leq values.

As an illustration, consider the data in Fig. 5 that were developed by statistical analysis of the noise spectrum in the problem office/conference room described previously. The data were derived by processing a continuous series of 100 ms time-averaged values of the signal, to obtain the L_1, L_{10}, L_{90} and L_{99} statistical exceedence levels. The Leq value is also provided for reference. Of particular interest is the relationship of the hearing threshold curve to the data in the 16 Hz octave-band. Note that the Leq value is very near threshold, and thus might tend to be discounted as a potential problem. However, two other factors must be taken into account: First, the L_{10} and L_1 levels are both *above* threshold and thus are presumed audible. Second, the L_{90} and L_{99} are both *below* threshold and likely inaudible. The insidious thing about the subjective listening experience with a spectrum of this type, is that the low-frequency rumble is perceived as *turning on and off* at some random or quasi-periodic rate which magnifies its "noticeability". When the statistical fluctuations in level are all *above* the hearing threshold, as for this example in the bands above 16 Hz, the ear likely perceives the fluctuations at their actual rate. In this situation, a difference in statistical levels, L_1 minus L_{99} or L_{10} minus L_{90}, as shown in Fig. 6 might be a useful metric to consider. The *rate of change* in level may also be a significant factor.

Fig. 5
Statistical Analysis of HVAC "Rumble" Sample

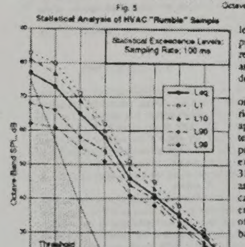
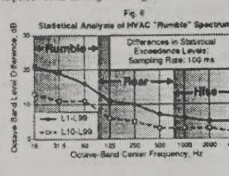


Fig. 6
Statistical Analysis of HVAC "Rumble" Spectrum



CONCLUDING REMARKS

At present, there is no consensus regarding appropriate criteria for assessing fluctuating low-frequency noise as it affects subjective response. We *do* know that whenever background noise from an HVAC system includes this kind of signal, people use the term "oppressive" to describe the environment. ASHRAE is most concerned about this problem because, unlike other situations encountered in the past, the solution does *not* involve adding more ductliner or another sound trap — but strikes at the heart of system design and component selection! Although much is known about the origins of these low-frequency noise problems, a concerted effort to address the issues involved is just beginning.

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[5] ASHRAE Research Project, RP-126, Lewis S. Goodfriend & Associates, (1975).

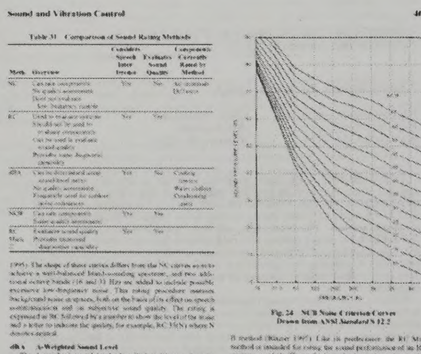
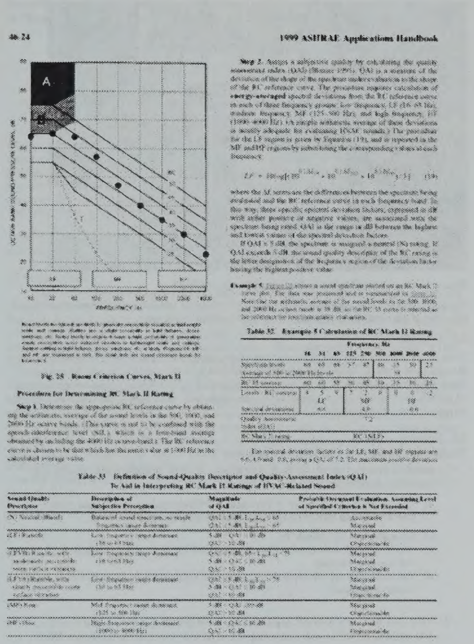
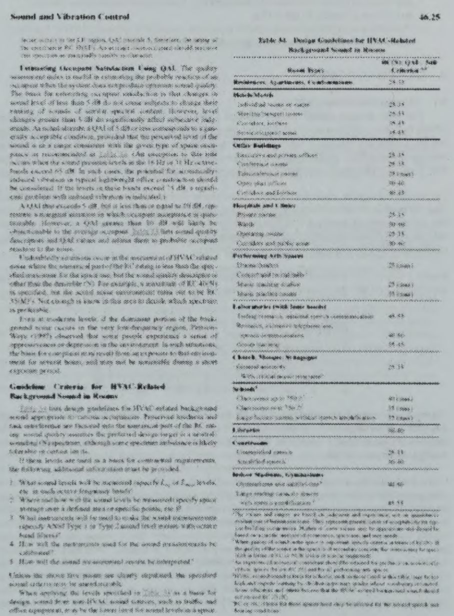


Table 31 Comparison of Sound Rating Methods

Fig. 24 NCB Noise Criterion Curves Drawn from ANSI Standard S12.2





Portland, Oregon
NOISE-CON 2011
2011 July 25-27

Dynamic measurements of wind turbine acoustic signals, employing sound quality engineering methods considering the time and frequency sensitivities of human perception

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E-Coustic Solutions
Okemos, MI 48805

A set of binaural time-recordings and analyses of wind turbine noise outside and inside a residence in Huron County, Michigan, made over two days and the intervening night in December 2009, is presented, centering on analysis at the time/frequency resolutions of human hearing according to the well-established practices of sound quality engineering and Soundscaping [1].

The purpose of this paper is to present wind turbine acoustic measurements at these time-frequency scalings and to suggest that such consideration, frequently neglected in favor of frequency resolution and long-term level averages, could augment the pereeptually inappropriate averages (often A-weighted) typically taken over much longer intervals. The authors maintain that most measurements of wind turbines up to now have not considered, or not adequately considered, these signals' very complex and varying behaviors at the time/bandwidth scalings of human perception. Although treating wind turbine noise aspects at all relevant frequencies, this paper will concentrate on low-frequency information.

1. INTRODUCTION

Human hearing and other senses (vision, touch…) are sensitive to and provide information from our environment on a micro-time scale. We emit information in spoken communication on a micro-time scale. Many acoustical measurements (Leq, etc.) are on a macro-time scale, yet we are immersed over macro-time in a life comprised of micro-time detail. It is incorrect to present only macro-time measurement results as representative of sensation, and perhaps impossible to try to combine both scales in a macro-time-only context (this paper will suggest some ways), but we must always try to assemble context-valid measurement data sets best representing "the *human* function." The scientific fields of sound quality engineering and Soundscaping provide insights in how this dichotomy or polychotomy might be approached. "Conventional methods often reduce the complexity of reality into controllable variables, which supposedly represent the scrutinized object – 'impoverished dimensionality'" (Schulte-Fortkamp and Bray, SAE Sound Quality Workshop 2009).

Low-frequency noise, particularly time-structured and even at low levels, is a current "hot topic in acoustics" in the Acoustical Society of America [2], and has unusual annoyance properties related to other frequency content or its absence. Situations of isolated low-frequency noise without other noise or with other noise of very low level may be more annoying than when other noise is present with overall level or loudness consequently higher [3].

A common measurement with wind turbines employs very high frequency-domain resolution enabling display of the harmonic series due to the blade-pass rate as an apparent near-steady pure tone family (macro-time scale), yet in the micro-time sensation range of human hearing and the function of its transducer, that result is completely unconnected to the high crest factor short-term events at low and very low frequencies resolvable at shorter time-scales and by wider acquisition bandwidths. The central measurement guiding other supporting analyses in any class of sound quality/human perception issues must be an auditorily-relevant one, involving the time-scale of the human receiver. At low frequencies, time and frequency resolutions become strenuously at odds with each other and challenge measurement. Once "the human receiver is served," other resolutions and measures may be employed to investigate causes.

The properties of human hearing cause the sensation of *any audible sound below about 50 Hz, even a continuous sine*, to be perceived as time-varying, with the sensation of periodic time structure increasing with decreasing signal frequency. This pure-tone finding (to be discussed) has been investigated beginning in 2010 and involves listening tests covering, as yet, a small number of test subjects [4, 5, 6]. More research needs to be done.

2. DESCRIPTION OF TEST SITE; LOCAL CONDITIONS

This wind turbine noise field test was conducted on December 17 and 18, 2009. The test location was outside a residence in Ubly, Michigan. The wind turbine utility which operates the wind turbines in this community is Michigan Wind I, which is comprised of 46 GE 1.5-MW SLE wind turbines. The facility began commercial operation in mid-December of 2008.

Figure 1 shows the location of the residence in the upper left quadrant and the wind turbine closest to this residence in the lower right quadrant. The distance between the test site and the base of the wind turbine is approximately 1500 feet. The trees and shrubs between the test site and turbine base visually obscured the base of the turbine.

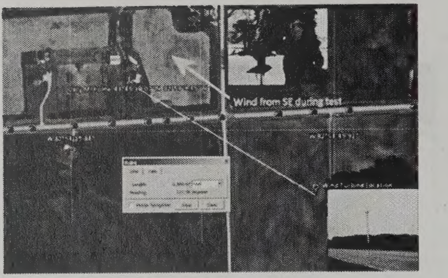

Figure 1 - Overview of Field Test Location, Michigan Wind I.

The wind turbine which dominated the sound field during the test as it appears from the road and driveway of the residence is shown in lower right quadrant of Figure 1.

2.1 Weather

Wind speed was under 10 mph from the start of the test on the afternoon of December 17, 2009 through noon of the following day. Wind direction was from the southeast during the test period. Temperatures ranged from 17 to 26 degrees F, with a mean of 22. Relative humidity ranged from 64 to 86%. No precipitation occurred during the test period. Skies were generally overcast with no extended cloudless periods.

2.2 Instrumentation

The field data were obtained and analyzed as follows:

1) Binaural Artificial HEAD Measurement System (HEAD acoustics HMS IV) with the following characteristics:
    a) ID-equalized, (Independent of Direction: resonances component of head-related transfer function (HRTF) only, for measurement compatibility) [7, 8].
    b) Microphones: 1/2" 54 mV/Pa.
    c) Artificial Head wore wind muffs whose spectral influence was entirely above 2.5 kHz and was compensated.
    d) The artificial head was mounted on a tripod at approximately 5 foot elevation to the center of the head.
2) Time-data files were recorded at a sensitivity of 94 dB[SPL] at 50% digital level (i.e., 100 dB[SPL] at 100%) with a sampling rate of 48 kHz and at 24 bit resolution. NOTE: One brief overload occurred in many hours of recording (verified as due to wind turbine low frequency level in excess of 100 dB[SPL]). Time-signal levels below 100 Hz sometimes exceeded 95 dB (SPL).
3) Analysis was performed using HEAD acoustics ArtemiS™ software. NOTE: For the figures in this paper, the left and right ears of the artificial head were averaged.

3. GENERAL ISSUES

3.1 Measurement bandwidth

For time-domain signals passed through band-pass filters, the measurement bandwidth affects both time and frequency resolutions: the wider a bandwidth, the better the time resolution but the poorer the frequency resolution. When frequency resolution is increased by assessing narrower bandwidths, time resolution decreases (impulse responses of narrower filters are longer than those of wider ones), potentially reducing auditorily-significant crest factors.

For broadband signals, wider bandwidths contain more power and hence yield higher band-levels than the band-levels of subdivisions of the same signal frequency span into narrower bandwidths (the phenomenon of density level). Yet selection of the wider low-frequency hearing-appropriate measurement bandwidths preserves hearing-appropriate time resolution and yields a more correct representation of perceptually-important crest factors.

Figure 2 shows two different types of measurement bandwidths: ANSI S1.11 1/3-octaves (also used in DIN and ISO loudness methods [9], and critical bands [10, 11, 12].

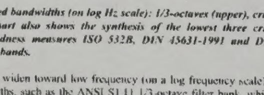

Figure 2 - Compared bandwidths (on log Hz scale): 1/3-octaves (upper), critical bands (lower). The 1/3-octaves chart also shows the synthesis of the lowest three critical bands in the psychoacoustic loudness measures ISO 532B, DIN 45631-1991 and DIN 45631/A1 from multiple 1/3-octave bands.

Critical bandwidths widen toward low frequency (on a log frequency scale), whereas constant-percentage bandwidths, such as the ANSI S1.11 1/3-octave filter bank, which retain a constant intervallic relationship, become narrower and narrower on a linear Hertz scale with decreasing frequency. Critical bandwidth filters used for measurement thereby exhibit more uniform and shorter impulse responses across frequency than do 1/n-octave filters, whose impulse responses grow longer and longer with decreasing frequency as shown in Figure 3. Among psychoacoustic models for time-varying loudness, the only currently standardized one, DIN 45631/A1 [12 op. cit.], is based upon critical bandwidths which have been shown to represent the time-response of human hearing [9 op. cit.]. Unfortunately, for historic reasons in standardization the lower-frequency critical bandwidths in DIN 45631/A1 as well as ISO 532B and DIN 45631-1991 are created by summing several 1/3-octave filters covering the necessary frequency span (as shown in Figure 2), destroying the true critical-bandwidth low-frequency time response.

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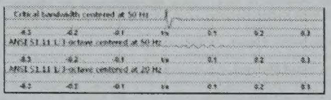

Figure 3 - Time-domain responses: Low-frequency band-pass filter (6th-order) impulse responses, from top to bottom: critical bandwidth centered on 50 Hz (Bark 1, approximate LF hearing "transducer" time response [9 op. cit.]), ANSI S1.11 1/3-octave centered on 50 Hz, and on 20 Hz. Results are identically scaled and from the same analytic signal. The time response of low-frequency human hearing (represented by the critical bandwidth Bark 1) is very short: most magnitude response occurs within about 10 milliseconds.

Appendices 1 and 2 present tables listing the impulse response durations covering 90% of the total magnitude, for different band types and band-center frequencies.

3.2 Crest factor

A particularly important characteristic often separating perception from measurement is the crest factor of the time signal (ratio of peak to rms value over an interval). Usually assessed in linear units, not in dB although it may be so expressed, it provides near-zero time weighting limited only by the available signal bandwidth. A perfect sine wave has a crest factor of 1.414, Gaussian noise between 3 and 5, and thermal noise (a Gaussian noise) approximately 4 [13]. Higher values suggest impulsiveness and identify a clearly time-varying signal.

The crest factor provides an overall basis for understanding transient and other time variation in context and serves as a prologue to further analyzing magnitudes or spectra versus time, especially considering auditory impression as a sound quality issue [14]. Figure 4 gives results for two versions of a synthetic band-limited signal differing only in crest factor, whose average spectral and Leq measurements are identical yet whose peak values, and maximum vs. minimum values (pattern strength [15]), differ widely. The crest factor difference relates to a significant difference in perceived loudness and for a sound supposedly near or below audibility, the potential of audibility and of attention drawn to "pattern" in a higher crest factor instance, due to the peak levels.

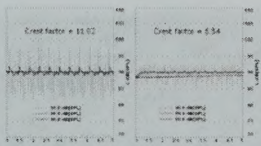

Figure 4 - Levels vs. time of a 90 dB[SPL] synthetic band-limited low-frequency signal with controllable crest factor (pink pseudo-noise 10Hz – 100Hz): the subjective impressions and apparent loudnesses differ despite identical Leq values. Measurements are at three time-weightings: 10 ms (yellow, approximate low-frequency-hearing-equivalent), Fast (red, 125 ms), and 10 seconds (black).

3.3 Comparison of levels from time and frequency domains

Figure 5 compares a time-domain (level vs. time) and a frequency-domain (average spectrum) measurement of the same signal, an automotive in-cabin Diesel-idle example. For both measurements the signal was filtered by a Bark 1 filter (critical bandwidth centered at 50 Hz). The average level values (Leq), 69 dB[SPL], are identical between the two measurements.

In the average spectrum an apparent tone near 50 Hz contributes the dominant level, 66 dB[SPL] (rms). Were this in fact a pure tone, its peak value would be 3 dB higher, or 69 dB[SPL]. In the level vs. time measurement, whose time weighting is due only to the impulse response of the Bark 1 critical bandwidth (approximately 10 ms), peak levels are seen to exceed 77 dB[SPL]. The apparent tone is shown thereby to be actually a very narrowband signal exhibiting much more fluctuation in level than would be the case for a pure tone. The crest factor in the time-domain measurement is approximately 8 to 11 dB (peaks about 8 to 11 dB higher than the rms value indicated in both the time and frequency domains).

A level difference of about 10 dB[SPL] corresponds approximately to a doubling or halving of psychoacoustic loudness [9 op. cit.], a very significant factor in evaluating according to the perceived character. The time-varying loudness metric DIN 45631/A1 [12 op. cit.] takes into consideration that loudness impressions of time-varying sounds are dominated by the higher values; mean values often under-report the impression (stationary loudness metrics report the mean value, a value in most cases below the N5 value). DIN 45631/A1 therefore reports the single value for loudness vs. time of N5, the value exceeded 5% of the time. Unfortunately, as will be discussed, DIN 45631/A1 is unable to act in accordance with low-frequency perception because its three lowest critical bandwidths are formed through summed 1/3-octave time-domain filters.

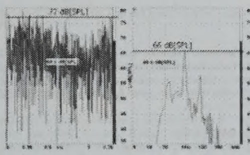

Figure 5 – Automotive in-cabin Diesel idle, band-limited through a Bark 1 filter (critical bandwidth centered on 50 Hz). Left: level vs. time weighted by the Bark 1 impulse response (Δt ~10 ms). Right: average spectrum (FFT, Δf = 2.69 Hz, Δt = 372 ms.) The average values calculated in time and frequency domains, ~69 dB[SPL], are effectively identical.

4. THE UNUSUAL TIME RESOLUTION OF LOW-FREQUENCY HUMAN HEARING

Figure 6 displays the impulse response of Bark 1, the lowest critical bandwidth of human hearing [9 op. cit.] (implemented here as a 6^{th}-order band-pass filter centered at 50 Hz), and on the same scale displays the time-signal of the automotive in-cabin Diesel idle situation first shown in Figure 5 (which showed the main magnitude of this signal to be apparently tonal at about 50 Hz). For approximately this signal frequency and below, the shortness of the impulse response of the hearing transducer may act as a "scanner" rather than an "integrator," effectively registering individual pressure events for positive-going and negative-going half-periods of low-frequency sinusoids and introducing the perception of time structure at a rate of twice the signal frequency or half the period, even for pure tones.

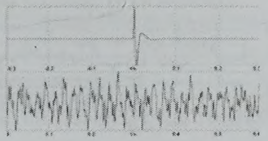

Figure 6 – Impulse response of Bark 1 (upper, the lowest critical bandwidth of human hearing), and a portion of the automotive in-cabin Diesel-idle time-signal (lower), on the same scale. The duration of the principal magnitude of the impulse response (about 10 ms) and the duration of individual time-signal peaks, are very similar.

5. MODULATION ANALYSIS

5.1 Normal use

Modulation analysis is an excellent tool frequently used to assess amplitude variations, especially periodic ones, of tonal and other signals. It determines the spectrum of the enveloping function of a presumed steady input signal. At sound frequencies where a tone can be perceived as steady without time-structure (human hearing acting as an integrator rather than a "scanner"), modulation analysis should give a null result (unmodulated), as its purpose is to measure the spectrum and spectral magnitude of an enveloping or magnitude-changing function.

5.2 Deliberate misuse to model perception of low-frequency pure tones and other short-term-variant low-frequency time structure

An unmodified envelope analysis would act as a full-wave rectifier of its "carrier" signal (envelope upper halves sinusoidal, lower halves abruptly reversing; the unfiltered modulation spectrum of a pure sine would thus exhibit a strong harmonic series due to the asymmetry). Modulation analyses of mid- and higher audible frequencies therefore normally low-pass-filter the envelope at appropriate frequencies to prevent the rectification waveform from being resolved, as it is unrelated to the modulation impression of such sounds and strictly speaking, does not represent modulation.

As an experiment with steady low-frequency sines (within Bark 1) and their perception, the envelope in modulation analysis was filtered only with the time-characteristic of human hearing in Bark 1 (Figure 7). The "carrier's" rectified waveform became resolved and could serve as a model matching the sensation of signal-period-related time structure; therefore such "misuse" of modulation analysis of low-frequency sound signals using, for example, a critical bandwidth as an envelope filter may have value as a research tool, as it tends at these low signal frequencies to agree with perception and may mimic the imperfection of human auditory modulation analysis which enters with low-frequency tones due to the very short impulse response of the acquisition bandwidth, causing the time-varying non-pitched impression. The asymmetry between upper and lower envelope waveform shapes causes the additional harmonic content seen in the "misused" modulation spectrum (lower) in Figure 7. Perhaps harmonic content similar to that shown in this analytic trial is generated from the human hearing's envelope-analysis process, and if true may be an enhancer of the time-varying perception.

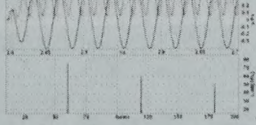

Figure 7 - Upper: a 30 Hz 85 dB[SPL] steady sine (blue) and its envelope (red), both passed through a 1-critical-bandwidth band-pass filter centered at 50 Hz (Bark 1). Lower: the "modulation" spectrum (based on 60 Hz due to two pressure events per signal period).

5.3 Application

The authors suggest that more research be undertaken regarding this hypothesis. For any demonstrable ear-transducer activity (whether resulting in audition or not) [16, 17] responding to low and very low frequency signals, the authors suggest using modulation analysis in this "unorthodox" manner tied to the impulse response duration of the acquisition critical bandwidth, to model the human-receiver behavior.

6. WIND TURBINE RESULTS

Wind turbine signals exhibit a fairly high crest factor at many frequencies. Level measurements vs. time through low-frequency critical bandwidth filters therefore register much higher levels than through 1/3-octave filters of the same general center frequencies, as shown in Fig. 8 (lower spectrogram).

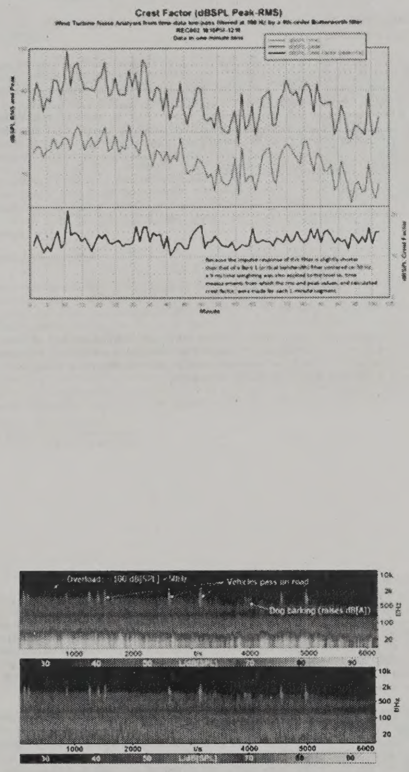

Fig. 8 - 1 hour 43 minutes of outdoor time-data starting at 10:15 PM. Upper charts: peak (red) and rms (blue) sound pressure levels in Bark 1 (lowest critical band <100 Hz), and crest factor in Bark 1 in dB (black), measured in 1-minute bins. Color spectrograms, 8.5 Hz – 14 kHz (not time-binned): 25 db[SPL] (black) – 95 dB[SPL] (white). Upper: highly overlapped critical bandwidth filter-bank in the time domain (Hearing Model of Sottek [18]), ear-equivalent time responses at all frequencies. ~10 ms in Bark 1. Lower: ANSI S1.11 1/3-octave filter-bank in time domain, set to 10 ms time weighting (achieved only >~500 Hz; impulse response of 10 Hz ANSI S1.11 1/3-octave filter is ~500 ms). Ordinate scales in both spectrograms 25 - 95 dB[SPL]. Due to displaying 1 hour 43 minutes of data, the duration and spacing of individual peaks exceed the number of pixels shown (aggregates of the actual peaks are visible; minima are under-represented) – this is not a matter of analysis, but of representation.. The next figure shows the same measurements over a one-minute interval.

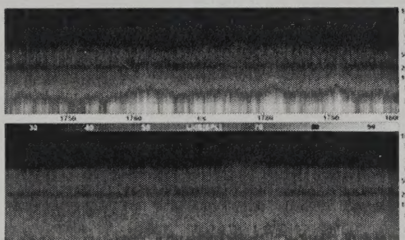

Figure 9 – Same measurements, one minute of time-data (minute 30 from above), identical scales. In the upper graph, white indicates 95 dB[SPL] or greater, which occurred frequently. Individual peak durations in Bark 1 (60 – 80 milliseconds) are resolved. The greatest variation, peak levels and time structure occur below ~100 Hz.

The Hearing Model of Sottek [18 ibid.] was developed to model the signal processing of human hearing. It includes an implementation of the auditory critical-bandwidth filter process via a highly-overlapped filter bank of asymmetric filters with widening bandwidths as seen on a logarithmic Hertz scale at lowering frequencies, and also models the traveling wave and nerve firings on the basilar membrane of the living ear. It has become a useful tool in transient analysis, particularly of short-duration transients and those involving low frequencies. Figures 8 and 9 above employ its intermediate spectrum vs. time determination to measure wind turbine data at the time response of human hearing and its transducers.

7. PSYCHOACOUSTIC MEASURES

The psychoacoustic measure Loudness, especially time-varying [12 op. cit.], is potentially useful in wind turbine analysis to quantify subjective impression. Loudness measures model the formation and summation of areas of excitation on the basilar membrane of the inner ear (cochlea) including the summation of all areas of excited hair cells to form the sensation of total or overall loudness [9 op. cit.]. Most real-world signals, certainly including those from wind turbines, exhibit variation with time and hence should be measured with a time-varying loudness procedure. The method DIN 45631/A1 (2008) [12 op. cit.] takes into account the duration of signals and calculates growth/release and temporal masking. Due to its adherence to the ISO 532B procedure [10, op. cit.] for stationary loudness involving pre-filtering into 1/3-octave bands (assigning six below 100 Hz to comprise Bark 1), signal below ~22 Hz is not included, a limitation with signals strongly weighted toward low frequency as are wind turbine signals. The W. Aures loudness method [19], available along with other methods in the software used for this project, omits the 1/3-octave pre-filtering (six 1/3-octaves below 100 Hz) thereby allowing measurement below 22 Hz: Temporal resolution is determined by the block size/sampling rate relationship, typically better at low signal frequencies than that obtained through ANSI S1.11 1/3-octave filters, though still considerably longer than that of true critical bandwidths. Figures 10 (Aures loudness method and 11 (DIN 45631/A1 time-varying loudness method) evaluate 200 seconds of data from the morning of December 18.

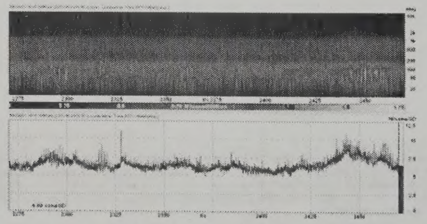

Fig. 10: 200 seconds circa 10:30 AM: psychoacoustic specific and overall loudness vs. time, W. Aures method ("FFT/HEAD" in HEAD acoustics ArtemiS™ software). This method is intended for stationary loudness and does not account for temporal masking and growth/release of loudness perception. The single value, 6.6 SoneGD (and the bar graph) indicate the arithmetic mean. At about 2312 seconds, the blade pass rate suddenly decelerates and level variation at that rate strengthens, becoming present at all signal frequencies from below 50 Hz to above 6 kHz for about 7 seconds (the crest factor increases synchronously). The auditory impression is of a rapid-onset, almost impact-like train of blade-pass events.

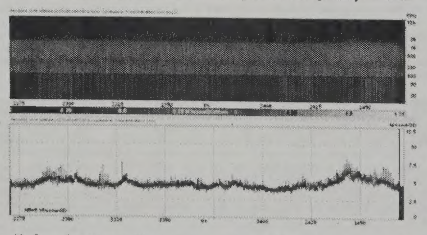

Fig. 11: Same data-set as in Figure 10: time-varying specific loudness vs. time and overall loudness vs. time, DIN 45631/A1 (2008) which accounts for temporal masking and growth and release of loudness perception. Note that the single value for this method (5.95 SoneGD) is N5, the loudness exceeded 5% of the time. Loudness methods deriving the lowest critical bandwidths by summing 1/3-octave time-domain filters (ISO 532B, DIN 45631-1991 and

45631/A1) degrade the true impulse responses of these critical bandwidths and therefore under-represent the true crest factors and momentary loudness contributions of signals in these bands.

8. SHORT-TERM HIGH-RESOLUTION TIME-FREQUENCY INFORMATION

A specialized tool, High-resolution Spectral Analysis [18 op. cit.] permits enhancing the time-frequency resolution product by up to a factor of 16 compared to the unity product of the FFT. It also deconvolves the smearing effect of the Hamming or other window, obtaining pure spectral lines. Employing this method at a time resolution of 0.17 second and frequency resolution of 0.34 Hz (Figure 12) reveals detailed information at infrasonic frequencies. The wind turbine signals (in all measurements) had dominant energy in the 1.5 – 10 Hz range, strongest between 2 and 8 Hz. Energy is quite concentrated in this spectral range. Whether or not significant, it includes the 2.3 Hz vicinity associated with a half-wavelength of 77 meters, the swept diameter of the rotor disk of a General Electric 1.5 MW SLE wind turbine.

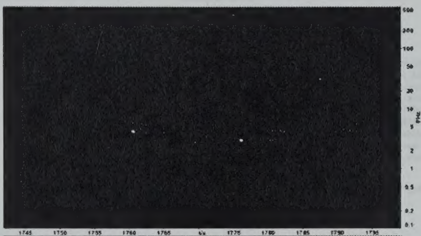

Fig. 12: Dominant energy in the frequency range 0.1 – 500 Hz is concentrated between about 1 and 10 Hz. Δt = 170 ms (~17 times the Bark 1 impulse response duration), Δf = 0.37 Hz, one-minute interval (Minute 30 from data of Fig. 8 and 9). This range of frequencies corresponds approximately to a half-wavelengh of 77 meters, the rotor diameter (for wavelength 154 meters, f ≈ 2.23 Hz). There are occasional "hot spots" at ~2.6 and ~4.6 Hz). The four temporal regions of higher level starting at 1760 seconds are spaced at ~9-second intervals.

would statistic tabulations from them such as the peak, rms and crest factor values exceeded 50%, 5%, and 1% of the time.

We hope that we have provided useful information on the nature of wind turbine noise, and encourage others to engage in further research aided by these results.

ACKNOWLEDGMENTS

The authors would like to thank colleagues (of author Bray) Dr.-Ing. Roland Sottek, André Fiebig, Georg Caspary and Prof. Dr.-Ing. Klaus Genuit for support of this avenue of investigation, productive discussions, initial small-scale listening tests regarding the perception of time structure from low-frequency pure tones. The authors also thank Prof. Dr. Brigitte Schulte-Fortkamp for her encouragement of this effort, and Charles Ebbing and Dr. Malcolm Swinbanks for productive discussions.

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9. OTHER TIME-VARYING LEVEL AND SPECTRAL PHENOMENA

A longer piece of data taken from about 10:20 AM December 18 at an intermediate time/frequency resolution pairing (Δf = 2.44 Hz, Δt = 0.41 second, FFT vs. time) resolved very narrow-band tone-like phenomena, modulated at the blade-pass rate (figure 13).

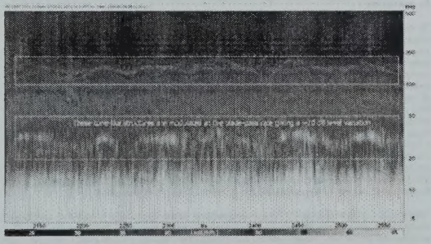

Fig. 13: 464 seconds circa 10:40 AM, FFT vs. time (Δf = 2.44 Hz, Δt = 0.41 second): when infrasound levels increase, very narrow-band tone-like phenomena circa 30 and 150 Hz (modulated at the blade pass rate) strengthen in magnitude and increase in frequency: the ~75 Hz structure is more stable in frequency. The alternating low- and higher-level horizontal "stripes" above ~180 Hz are not an analysis artifact; they may be a comb-filter effect due to the ground reflection. Amplitude change at the blade-pass rate is visible at many signal frequencies (view this graph closely for fine detail such as the blade-pass rate). NOTE: Infrasound levels exceed the 65 dB[SPL] level assigned to white in the color-map.

DISCUSSION

We have shown that wind turbine signals are strongly and varyingly time-structured, perhaps unusually so at frequencies below 100 Hz which may affect the likelihood of audibility or other physiological response from low-frequency and even infrasonic wind turbine noise proving to be different from thresholds calculated from Leq and from tone-sensitivity such as by ISO 226 [20] because of the crest factor, rapid rate of change on the order of ~60 milliseconds, and the pattern-sensitivity of the human receiver [15 op. cit.].

To help bridge the gap between conventional macro-time measurements in level and frequency and the heretofore-missing consideration of the micro-time-sensitive human receiver, the authors suggest adding to the conventional measures some others which track these sensitivities. A plot of low-frequency peak value, rms value and crest factor, calculated at ear-appropriate time resolution for example (as in Figure 8) in 1-minute bins and plotted versus time would assist, as

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APPENDIX I

Table: Impulse response duration (for 90% magnitude) versus band type and center frequency

Center frequency, Hz. (1/3-octave spacing DIN Row B)	**Time responses, ms:**			
	Bark* (*4th-order Butterworth)	**ERB***	**1/3-octave** (6th-order [ANSI S1.11])	**1/3-octave** (4th-order Butterworth)
25	-	32.9	201.1	132.8
32	-	30.0	159.6	105.4
40	-	25.9	126.7	83.6
50	8.8	27.2	100.6	66.4
63	7.7	24.1	79.8	52.7
80	7.0	23.9	63.4	41.8
100	8.8	20.8	50.3	33.2
125	7.8	19.9	39.9	26.4
160	7.0	15.5	31.7	20.9
200	7.1	16.1	25.1	16.6
250	7.6	14.3	20.0	13.2
315	6.9	12.8	15.8	10.5
400	6.6	11.2	12.6	8.3
500	6.3	9.7	10.0	6.6

APPENDIX 2

Impulse response durations for 90% magnitude, 1/3-octave filters in time domain		
Center frequency	4th-order	6th-order ANSI S1.11
1.00 Hz	3294 ms	4989 ms
1.25 Hz	2616 ms	3963 ms
1.60 Hz	2078 ms	3148 ms
2.00 Hz	1651 ms	2500 ms
2.50 Hz	1311 ms	1986 ms
3.15 Hz	1042 ms	1578 ms
4.00 Hz	827 ms	1253 ms
5.0 Hz	657 ms	995 ms
6.3 Hz	522 ms	791 ms
8.0 Hz	415 ms	628 ms
10.0 Hz	329 ms	499 ms
12.5 Hz	262 ms	396 ms
16.0 Hz	208 ms	315 ms
20.0 Hz	165 ms	250 ms
25.0 Hz	131 ms	199 ms
31.5 Hz	104 ms	158 ms
40.0 Hz	82.7 ms	125 ms
50 Hz	65.7 ms	99.5 ms
63 Hz	52.2 ms	79.1 ms
80 Hz	41.5 ms	62.8 ms
100 Hz	32.9 ms	49.9 ms
125 Hz	26.2 ms	39.6 ms
160 Hz	20.8 ms	31.5 ms
200 Hz	16.5 ms	25.0 ms
250 Hz	13.1 ms	19.9 ms
315 Hz	10.4 ms	15.8 ms
400 Hz	8.28 ms	12.5 ms
500 Hz	6.57 ms	9.96 ms
630 Hz	5.23 ms	7.91 ms
800 Hz	4.16 ms	6.28 ms
1000 Hz	3.30 ms	4.99 ms
1250 Hz	2.62 ms	3.96 ms
1600 Hz	2.09 ms	3.15 ms
2000 Hz	1.67 ms	2.50 ms
2500 Hz	1.32 ms	1.99 ms
3150 Hz	1.06 ms	1.57 ms
4000 Hz	0.84 ms	1.25 ms
5000 Hz	0.68 ms	1.00 ms
6300 Hz	0.51 ms	0.79 ms
8000 Hz	0.40 ms	0.63 ms
10000 Hz	0.33 ms	0.50 ms
12500 Hz	0.26 ms	0.40 ms
16000 Hz	0.22 ms	0.31 ms
20000 Hz	0.16 ms	0.25 ms

APPENDIX 3 [17 op. cit.]

Alec N. Salt, Ph.D. (14 December 2010) (used with permission)

Does the infrasound from wind turbines affect the inner ear?

There is controversy whether prolonged exposure to the sounds generated by wind turbines adversely affects human health. The unweighted spectrum of wind turbine noise slowly rises with decreasing frequency, with greatest output in the 1-2 Hz range. As human hearing is insensitive to infrasound (needing over 120 dB SPL to detect 2 Hz) it is claimed that infrasound generated by wind turbines is below threshold and therefore cannot affect people. The inner hair cells (IHC) of the cochlea, through which hearing is mediated, are velocity-sensitive and insensitive to low frequency sounds. The outer hair cells (OHC), in contrast, are displacement-sensitive and respond to infrasonic frequencies at levels up to 40 dB below those that are heard. A review found the G-weighted noise levels generated by wind turbines with upwind rotors to be approximately 70 dB G. This is substantially below the threshold for hearing infrasound which is 95 dB G but is above the calculated level for OHC stimulation of 60 dB G. This suggests that most wind turbines will be producing an unheard stimulation of OHC. Whether this is conveyed to the brain by type II afferent fibers or influences other aspects of sound perception is not known. Listeners find the so-called amplitude modulation of higher frequency sounds (described as blade "swish" or "thump") highly annoying. This could represent either a modulation of audible sounds (as detected by a sound level meter) or a biological modulation caused by variation of OHC gain as operating point is biased by the infrasound. Cochlear responses to infrasound also depend on audible input, with audible tones suppressing cochlear microphonic responses to infrasound in animals. These findings demonstrate that the response of the inner ear to infrasound is complex and needs to be understood in more detail before it can be concluded that the ear cannot be affected by wind turbine noise.

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Invited Paper

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WHY IS WIND TURBINE NOISE POORLY MASKED BY ROAD TRAFFIC NOISE?

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Abstract
The possibility of road traffic noise masking noise from wind turbines was explored among residents living close to wind turbines in the Netherlands (n = 725) with different levels of road traffic noise present. No general masking effect was found, except when levels of wind turbine sound were moderate (35 – 40 dB(A) Lden) and road traffic sound level exceeded that level with at least 20 dB(A). This low masking capacity may be due to the different time patterns of these noise sources, both on a small time scale (car passages/regular blade passing) and a larger time scale (diurnal and weekly patterns). Also, wind turbine sound is relatively easy audible and may be heard upwind more often than road traffic.

Keywords: Wind turbine noise, road traffic noise, masking, audibility, time patterns.

1 Introduction

Suitable sites for wind turbines can be difficult to find due to conflicting requirements. Placing wind farms close to the electric grid and existing roads (both are usually better available in populated areas) is favourable for investment costs, but it may increase the possibility that neighbours may be visually and aurally disturbed. It is therefore not uncommon that wind turbines are planned to be erected at distances from dwellings that are unacceptable by the local residents.

The individual appraisal of wind turbines planned close to one's home is not irrational but based on considerations such as the evaluation of the wind turbines' impact (scenic and otherwise) and feelings of equity and fairness [1]. The apprehension that for example the noise will be disturbing in an otherwise comparable quiet area has been confirmed by research: wind turbine noise may be louder and is apparently more annoying than was assumed before the growth in wind turbine numbers and power in the '90s [2, 3]. The recommended noise limits (different in different countries), and consequently a minimum distance depending on the number of wind turbines and their sound power levels, should therefore be kept or should even be more rigorous if the original level of noise protection is to be maintained.

To decrease the adverse impact it has been suggested that masking sounds could create a situation where the wind turbines could not be heard and therefore not annoying. Outdoor sounds that are potential maskers are natural sounds like wind induced sounds from trees or sound from sea waves, or manmade noise, of which road traffic appears to be the most common. Models have previously suggested that natural sounds are fairly good potential maskers for wind turbine noise due to, for example, similarities between the broadband noise of vegetation and wind turbine sound [4]. Experimental listening tests have however shown that the detection thresholds for wind turbine noise in the presence of natural sounds from trees or sea waves are in the range -8 to -12 dB S/N-ratio, implying that the ambient sound must have a considerably higher level in order to completely mask the wind turbine noise [5]. Loudness tests, in the same series of experiments, indicated on the other hand that introducing natural sounds, for example the rustling of trees, of the same level as the wind turbine sound, could reduce the perceived sound level of the wind turbine sound with up to 5 dB. This hypothesis is yet to be experienced in the field; it is not obvious that this would lead to decreased risk for noise annoyance.

The masking effect of road traffic on wind turbine noise has to our knowledge not been studied in listening tests. An epidemiological study carried out in the Netherlands 2007 [3] provided an opportunity to compare the perception of wind turbine noise at different levels of ambient noise, in this study mainly from road traffic. The results indicate that also for traffic noise the masking effect is low [6]. The objective of this paper is to discuss why road traffic does not decrease the risk for being annoyed by wind turbine sound.

2 Method

A field study was carried out in the Netherlands among residents in wind farm areas. A stratified sample of 1948 people living within different levels of wind turbine noise were approached with a questionnaire about environmental issues in their residential area; 725 responded satisfactory (37%; a non-response analysis showed no statistically significant differences between responders and non-responders). The questionnaire comprised two parallel parts measuring perception of sound and attitude towards the sound source; one part concerning road traffic sound and the other concerning wind turbine sound. The possibility to hear the sounds from the dwelling or the garden/balcony was measured binary with no/yes. Noise annoyance was measured with several items, referring both to outdoor and indoor situations. Two factor scores derived from five items (WT annoyance, Cronbach's alpha 0.89) and six items (RT annoyance, Cronbach's alpha 0.86), respectively, were used as dependent variables with mean = 0 and standard deviation = 1. Attitude towards the noise source's impact on landscape scenery were measured with a 5-point scale from "very positive" to "very negative". Noise sensitivity was measured on a 5-point scale. Stress was measured with 6 items and factorized (Stress; Cronbach's alpha 0.84).

The immission levels in dB(A) of wind turbine sound outside the dwelling of each respondent were calculated as recommended by the international ISO standard [7]. The levels correspond to a situation with a neutral atmosphere and a wind speed of 8 m/s at 10 m height. The immission levels were transformed into levels of day-evening-night values (Lden) by adding 4.7 dB [8]. Levels of road traffic sound were obtained from the Dutch National Institute for Public Health (RIVM) who supplied calculated Lden immission levels due to traffic in 5 dB intervals for a 25 by 25 m grid over the entire country. The levels approximate road traffic exposure as there was no railroad or airport close to any of the respondents. The respondents were divided into sub-samples due to the levels of road traffic sound exceeding the levels of wind turbine sound. This paper explores to what extent wind turbines were heard or were annoying when the sound levels of road traffic exceeded that of wind turbines with 5-10 dB (n = 79), 10-15 dB (n = 138), 15-20 dB (n = 108) or 20-25 dB (n = 67). Noise annoyance due to wind turbines is influenced by having an economical benefit from the wind turbines or not [3]. Only respondents that did not benefit were included when the impact of road traffic noise on annoyance with wind turbine noise was explored and the sample sizes were therefore somewhat reduced in Figure 2 (below): 5-10 dB (n = 70), 10-15 dB (n = 119), 15-20 dB (n = 102) or 20-25 dB (n = 66). For more detailed description of the research methods see [3] and [6].

3 Perception of wind turbine sound in different levels of road traffic sound

3.1 Possibility to hear wind turbine sound

The proportions of respondents that reported hearing wind turbine sound outside their dwelling increased from 0-23% at the interval 30-35 Lden to 59-69% at 40-45 Lden (Figure 1). Though there are differences between the groups these are not statistically significant, *i.e.* no masking affect was detected.

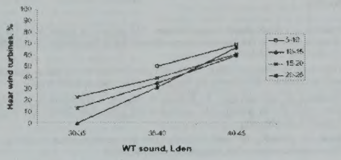

Figure 1. Proportion of respondents that could hear wind turbine sound outdoors at their dwelling or garden/balcony (%) related to levels of wind turbine sound (Lden) for four situations where road traffic sound levels exceeded wind turbine sound levels with 5-10, 10-15, 15-20 or 20-25 dB(A) Lden

3.2 Annoyance due to wind turbine sound

The mean annoyance score increased from -0.6 - -0.5 at the interval 30-35 Lden to 0.1 – 0.8 at 40-45 Lden (Figure 2). When looking at the four RT-WT level difference groups, a reduction of annoyance was found, but only for respondents in the interval 35 – 40 Lden of wind turbine noise when the road traffic noise exceeded wind turbine noise with 20 – 25 dB. This difference was statistically significant (t = -0.69, $p<0.05$), other differences were not.

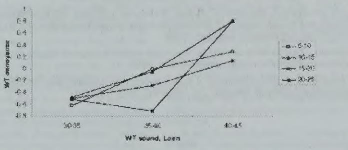

Figure 2. Mean annoyance score for wind turbine noise related to levels of wind turbine sound (Lden) for four situations where road traffic sound levels exceeded wind turbine sound levels with 5-10, 10-15, 15-20 or 20-25 dB(A) Lden.

Annoyance due to wind turbine noise was positively correlated to annoyance with road traffic noise ($r = 0.26$, $p<0.001$) suggesting that there was no masking effect but an increased risk for annoyance if both noises were present. This result was explored further in a multivariate general linear model with two dependent variables present simultaneous: annoyance with wind turbine noise and annoyance with road traffic noise (Figure 3).

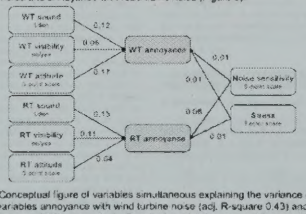

Figure 3. Conceptual figure of variables simultaneous explaining the variance of the two dependent variables annoyance with wind turbine noise (adj. R-square 0.43) and road traffic noise (adj. R-square 0.38), respectively. Result of multivariate general linear model. Adjusted for economical benefits from wind turbines. Partial eta-squared values: only statistically significant associations are shown.

Noise from wind turbines, together with visibility of wind turbines and attitude to their impact on the landscape, only explained the variance in annoyance due to wind turbines, but not the variance in annoyance due to road traffic. Similar, noise levels, visibility and attitude regarding road traffic were only associated to annoyance with road traffic noise. However, noise sensitivity and stress explained part of the variance of both annoyance score, which explains the correlation between them. The test indicates that there was no enhanced risk for annoyance due to double exposure: this risk is simply the sum of both separate risks.

3.3 Conditions influencing loudness of wind turbine sound

One of the questions in the WINDFARMperception study survey was about conditions when the wind farm sound was louder or less loud [10]. Figure 4 shows the results: more respondents thought the sound from the wind farm was louder when the wind blew from the wind farm towards the dwelling or when the wind was stronger. Unfortunately we do not know whether respondents were referring to the near-ground wind they were exposed to or the higher altitude wind that the blades were exposed to (which can be inferred from the rotational speed and the backwards bending of the blades). A minority of respondents (22%) thought the sound was less loud at night. 40% thought the sound was louder at night and another 38% saw no clear difference between night and day in this respect.

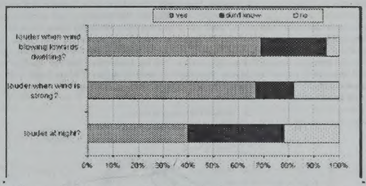

Figure 4. Opinions on conditions when wind farms are perceived as being louder or less loud (based on [10])

4 Possible acoustical explanations for the poor masking effect

In the text above WT and RT sound levels were compared based on their Lden at receiver locations. However, when the Lden values are equal this does not mean that both sounds are acoustically equal, nor that the levels are equal at all times or the sounds have the same perceptive quality–even when they are of the same level. The distributions over time and frequency, as well as the character of the sound and the altitude of the source, have an influence on their perception, and thus possibly on the annoyance they may cause. These influences will be discussed here.

4.1 Diurnal variations in level

Road traffic noise usually subsides at night and in early morning resumes to the morning rush hour level. Figure 5 shows the change in level for two situations: a busy motorway in the central part of the Netherlands and the city ring road of Amsterdam (figure taken from [9]). It also shows that the lowest night time levels Lmin are approximately 8 dB below the highest levels in day time for the motorway; for the ring road the difference is somewhat higher: 10 dB. When compared to Lden, the minimum levels are approximately 12 dB lower.

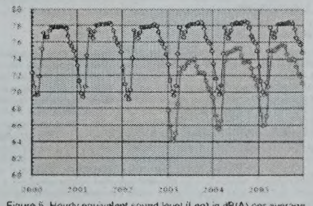

Figure 5. Hourly equivalent sound level (Leq) in dB(A) per average day in each of six years at a busy motorway (blue dots) and over three years at the Amsterdam ring road (orange dots).

The diurnal variation for an 80 m hub height wind turbine is rather different as figure 6 shows for an average day in one year, where wind speed data from 1987 have been used (figure taken from [10]).

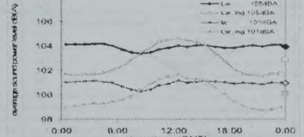

Figure 6. Hourly averaged real and estimated (log) sound power level of a Vestas V80-2MW at two power settings.

Here the night time level is on average higher than daytime levels, as in daytime the 80 m wind is slowed down by more intense coupling to lower altitude air due to vertical movements that are stronger when the sun is up. Here the night time level is approximately 6 dB lower than the Lden due to this wind turbine, the lowest (daytime) level is 7 dB lower than Lden. Hence, when road traffic and wind turbines produce the same Lden sound level, the RT level in the quietest hour of the night is 12 dB lower whereas the WT level at that time is 6 dB lower and thus, at that time, 6 dB higher than the RT sound level. In daytime this difference is smaller (3 dB).

4.2 Spectral differences

Road traffic sound as well as wind turbine sound is relatively broad band. In figure 7 the spectral distributions of the sounds are plotted as A-weighted octave band levels where each level is given relative to the total sound power. Expressed this way, the reference total sound power is equal (viz. 0 dB) for each source. The WT spectrum is the sound power spectrum of a Vestas V80-2MW, the RT spectra are those used for light, medium and heavy vehicles in the Dutch calculation model for road traffic noise, and the average spectrum for all traffic as measured at the city ring road (taken from [9]). The figure shows that wind turbine sound, when compared to road traffic sound, is relatively loud at low frequencies up to 500 Hz and then less loud (at higher levels the wind turbine is again louder, but such high frequencies are irrelevant at distances over several hundreds of meters, and even more so when indoors). Of course at some distance from the sources the spectrum will change due to frequency dependent attenuation, but that will affect the spectra in the same way and thus not change the relative contributions. If the WT and RT sound levels are equal at the receiver, the WT will be louder at frequencies below 500 Hz, and less loud above that frequency. All spectral levels of the wind turbine will be lower then the RT spectral levels (averaged over traffic types) when the wind turbine level is reduced by at least 8 dB. The other way around, all RT spectral levels will be lower than the (average) WT levels if the wind turbine is at least 4 dB louder.

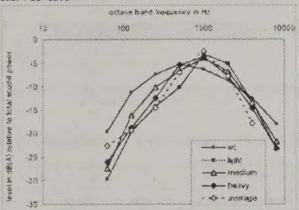

Figure 7. Octave band spectra (each level relative to total sound power level) of a wind turbine (wt) and of light, medium and heavy vehicles and the average as determined on the city ring road.

4.3 Sound character: swishing

Swishing is an important characteristic of wind turbine sound: 75% of the respondents of the WINDFARMperception study thought that swishing or lashing was the best description of the sound [10]. Reported swish levels (the level of the peaks occurring at blade passing frequency relative to the base level in between peaks) are up to approximately 5 dB, highest reported values are 9 dB [11]. Obviously the audible modulation attracts attention, just as the reverse gear beep on trucks or the signal of an alarm clock do. From various studies it follows that this modulation is equivalent in annoyance to the un-modulated sound at an approximately 5 dB higher level.

4.4 Sound shadow

Usually a sound source is louder downwind of the source than upwind in the sound shadow, where only reflected and turbulence scattered, but no direct sound rays can reach an observer. The distance between the sound source and its sound shadow depend on atmospheric conditions and on the height of the source. With a normal temperature profile (temperature decreasing with height) in a still atmosphere sound rays refract upward and the sound shadow is along a circle with the source in its center. When some wind is present, and it is when a wind turbine is in operation, the refraction due to wind is usually stronger and there is a sound shadow only in the upwind direction. The distance to the source depends on the wind speed and the height of the source: for a high source the sound shadow is further away than for a low source. In figure 8 the contours of the sound shadow related to a sound source at 95 m height are plotted, using night time atmospheric data from the Royal Netherlands Meteorological Institute and an algorithm provided by Makarewicz et al [12]. The contours are open as there is no sound shadow in the downwind direction. For a source at 95 m height the minimum and maximum distances to the sound shadow in the upwind direction at night are just over 500 m and just over 1 km (average over all days 650 m). For a road, the sound shadow is at least 130 m and at most 250 m (average: 160 m) from the road in the upwind direction. This means that for residents at several hundreds of meters from a road may often not hear the road when it is downwind, but they will often be able to hear wind turbines in that situation if these are alongside the road.

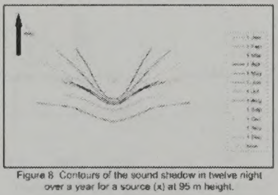

Figure 8. Contours of the sound shadow in twelve night over a year for a source (x) at 95 m height.

5 Discussion

Most respondents in the WINDFARMperception survey thought the sound from one or more modern, tall wind turbines at night is louder than or not very different from the sound in daytime, which is consistent with the actual average sound levels of these turbines. Also, most respondents thought the sound is louder in strong winds and when the wind is blowing towards their dwelling, which is consistent with the wind dependent sound power level and the directivity of the sound (higher at the downwind side).

Comparing equal Lden levels of road traffic and wind turbine sound gives no information on the levels or the relative audibility of each sound at specific times. In fact, at equal Lden values wind turbine sound levels will be higher at night than road traffic sound levels because of the different diurnal patterns, the different spectral distributions and the modulation present in wind turbine sound. It can be estimated that the Lden due to modern, tall wind turbines must be 6 dB (diurnal variation) + 8 dB (spectral differences) + 5 dB (amplitude modulation) = 19 dB lower then the Lden due to road traffic in order to obtain equal hourly levels at the least busiest traffic hours at night. If the road is a provincial road and not a very busy motorway, there may be shorter or longer periods of time, especially at night, when no road traffic at all can be heard. In that case the Lden due to that road traffic is in fact irrelevant when determining the audibility of a wind turbine.

It is not clear whether the greater distance of the sound shadow to a source is important in relation to annoyance. An upwind receiver may be in the sound shadow of a road but not in the sound shadow of a wind turbine along that road, but the receiver is in that case also at the front side of the turbine which emits less sound than the rear side.

Acknowledgments

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Comment Letter P170

PHYSICS OF FLUIDS 22, 015110 (2010)

Large eddy simulation study of fully developed wind-turbine array boundary layers

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It is well known that when wind turbines are deployed in large arrays, their efficiency decreases due to complex interactions among themselves and with the atmospheric boundary layer (ABL). For wind farms whose length exceeds the height of the ABL by over an order of magnitude, a "fully developed" flow regime can be established. In this asymptotic regime, changes in the streamwise direction can be neglected and the relevant exchanges occur in the vertical direction. Such a fully developed wind-turbine array boundary layer (WTABL) has not been studied systematically before. A suite of large eddy simulations (LES), in which wind turbines are modeled using the classical "drag disk" concept, is performed for various wind-turbine arrangements, turbine loading factors, and surface roughness values. The results are used to quantify the vertical transport of momentum and kinetic energy across the boundary layer. It is shown that the vertical fluxes of kinetic energy are of the same order of magnitude as the power extracted by the forces modeling the wind turbines. In the fully developed WTABL, the kinetic energy extracted by the wind turbines is transported into the wind-turbine region by vertical fluxes associated with turbulence. The results are also used to develop improved models for effective roughness length scales experienced by the ABL. The effective roughness scale is often used to model wind-turbine arrays in simulations of atmospheric dynamics at larger (regional and global) scales. The results from the LES are compared to several existing models for effective roughness lengths. Based on the observed trends, a modified model is proposed, showing improvement in the predicted effective roughness length. © 2010 American Institute of Physics. [doi:10.1063/1.3291077]

I. INTRODUCTION

With the recognition that wind energy may become an important contributor to the world's overall energy portfolio, both on- and off-shore wind farms are expected to become more extended and cover increasingly larger surface areas. With the characteristic height of the atmospheric boundary layer (ABL) of about 1 km, wind farms with horizontal extents exceeding 10–20 km may therefore approach the asymptotic limit of "infinite" wind farms, and the boundary layer flow may approach the fully developed regime. While for a lone-standing wind turbine, the power extraction is due to the difference in the upstream and downstream kinetic energy fluxes, for a turbine in a fully developed wind-turbine array boundary layer (WTABL), the kinetic energy must be entrained from the flow above. Therefore, the vertical structure and turbulence physics becomes a critical ingredient in determining the efficiency of a turbine in very large wind farms. The vertical structure can be compactly represented using horizontally averaged flow variables. The present paper is devoted to a study of such variables based on a suite of large eddy simulations (LES) in which various parameters characterizing the wind farm are varied.

Blade aerodynamics and single turbine optimization for maximum power extraction is a well-explored topic (see, e.g., Refs. 1 and 2), building in large part on much accumulated experience from propeller aerodynamics. There is also a significant number of studies that have focused on the structure of wakes from individual wind turbines (see, e.g., Refs. 3–12). Also, a number of studies and models have been developed, dealing with superposition of wakes stemming from a finite number of wind turbines,[13–17] even considering the limit of infinitely many wind turbines, as done in pioneering works by Lissaman[18] (1979) and Frandsen[19] (1992). Approaching the problem from the side of large atmospheric dynamics scales, wind-turbine arrays are often modeled as surface roughness elements or net drag coefficients, leading to an increased roughness length that needs to be parametrized. Examples of such studies include papers that aim at predicting interactions among wind turbine farms with the global climate,[20] regional meteorology,[21] or more short-time weather patterns.[22] In such simulations, the horizontal computational resolution near the ground is most often significantly coarser than the height of the boundary layer. In

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At high Reynolds numbers and away from the bottom surface and the wind-turbine surfaces, viscous stresses can be neglected.

The mean velocity distribution is a complex, three-dimensional field including wakes, the boundary-layer shear, etc. A further simplification can be sought by performing a horizontal spatial average. We envision a horizontal average over directions y (spanwise) and x (streamwise). Horizontal averaging of this type is commonplace in studies of vegetation canopies (see, e.g., Refs. 26 and 27 for more details) and is denoted henceforth by brackets $\langle\cdots\rangle$. This spatial averaging and the assumption of horizontal statistical homogeneity yield $\langle\bar{v}\rangle=\langle\bar{w}\rangle=0$ and $\partial\langle\bar{u}\rangle/\partial x=0$. Then, the momentum equation reduces to

$$0=-\frac{1}{\rho}\frac{dp_\infty}{dx}-\frac{\partial}{\partial z}\left(\langle\overline{uw}\rangle\right)+\langle\bar{f}_x\rangle,$$

$$=-\frac{1}{\rho}\frac{dp_\infty}{dx}-\frac{\partial}{\partial z}\left(\langle\overline{u'w'}\rangle+\langle\bar{u}''\bar{w}''\rangle\right)+\langle\bar{f}_x\rangle. \quad (2)$$

Here, the fluctuating velocities $\bar{u}''=\bar{u}-\langle\bar{u}\rangle$ and $\bar{w}''=\bar{w}-\langle\bar{w}\rangle$. Further, in this equation, the "dispersive stress" is commonly defined as $\langle\bar{u}''\bar{w}''\rangle$, arising due to correlations among the spatially inhomogeneous mean horizontal and mean vertical velocities.[26]

In order to also study the vertical transfer of kinetic energy from the upper ABL to the wind-turbine array, we consider the mechanical energy equation of the time- and horizontal-averaged flow, i.e., the transport equation for $\langle\bar{u}\rangle^2/2$, obtained by the product of $\langle\bar{u}\rangle$ times the mean x-momentum equation (2),

$$-\frac{1}{\rho}\langle\bar{u}\rangle\frac{dp_\infty}{dx}-\frac{\partial}{\partial z}\left(\langle\overline{u'w'}\rangle\langle\bar{u}\rangle+\langle\bar{u}''\bar{w}''\rangle\langle\bar{u}\rangle\right)+\langle\overline{u'w'}\rangle\frac{\partial\langle\bar{u}\rangle}{\partial z}$$

$$+\langle\bar{u}''\bar{w}''\rangle\frac{\partial\langle\bar{u}\rangle}{\partial z}-W_f=0. \quad (3)$$

Here, $W_f(z)=-\langle\bar{u}\rangle\langle\bar{f}_x\rangle$ (as will be remarked later, due to the order of averaging operations, this term differs slightly from the power density extracted from the flow by the wind turbines). It can be remarked that in the inlet region of a wind farm, the first advective term (i.e., the streamwise derivative of the mean flow kinetic energy flux $\frac{1}{2}\langle\bar{u}\rangle^3$) is expected to be important. For very large wind-turbine arrays, the developing terms become negligible and vanish in the fully developed regime by definition. Consequently, these terms are left out of the above energy transport equation.

One of the objectives of this paper is to perform simulations of an array of wind turbines in a fully developed condition and evaluate the turbulent momentum and kinetic energy flux terms, $\langle\overline{u'w'}\rangle$ and $\langle\bar{u}\rangle\langle\overline{u'w'}\rangle$, respectively, and to compare them with the dispersive fluxes caused by spatial variations, i.e., terms $\langle\bar{u}''\bar{w}''\rangle$ and $\langle\bar{u}\rangle\langle\bar{u}''\bar{w}''\rangle$. Also, the vertical profiles of turbulent and "dispersive" dissipations, i.e., $-\langle\overline{u'w'}\rangle\partial\langle\bar{u}\rangle/\partial z$ and $-\langle\bar{u}''\bar{w}''\rangle\partial\langle\bar{u}\rangle/\partial z$, respectively, will be determined by averaging the simulation results. One goal is to compare the typical magnitudes of these terms and compare them to the mechanical power extracted by the wind turbines and to ascertain the relative effects of the dispersive terms compared to the turbulent ones.

B. Models for effective roughness

Pioneering studies regarding quantification of effective surface roughness z_0 in the ABL were done by Kutzbach[28] and Lettau.[29] The first efforts linking roughness effects to the effects of large wind farms in the planetary boundary layer were done by Templin,[30] Newman,[31] and Bossanyi *et al.*[32] More rigorous treatments have been presented more recently by Frandsen[19] and Frandsen *et al.*[33] using the mean momentum equation and also linking the surface wind at hub height with the geostrophic wind speed.

1. Lettau's formula

In order to estimate an effective value for z_0 based strictly on visual site surveys and using geometric measurements to describe characteristic surface elements, Lettau,[29] by considering a slight simplification of an earlier equation,[28] proposed the following simple (geometric) expression: $z_{0,\mathrm{Lett}}=0.5hA/S$, where h is the average vertical extent, or obstacle height, A is the silhouette area of the average obstacle, or area measured in the vertical crosswind-lateral plane "seen" by the wind in the approach toward a characteristic obstacle, S is the specific area, measured in the horizontal plane. The numerical factor 0.5 corresponds to an assumed average drag coefficient of the characteristic individual obstacle. Setting h equal to the turbine height z_h, using $A=\pi D^2/4$ as the rotor disk area, and expressing S in terms of the spacing between wind turbines in multiples of rotor diameter, $s_xD\times s_yD$, the Lettau formula reads as

$$z_{0,\mathrm{Lett}}=\frac{z_h\pi}{8s_xs_y}. \quad (4)$$

This model has been recently used for a study on the global weather impact of large wind farms.[23]

2. Frandsen theory

The idea of a wind farm induced ABL was introduced by Templin,[30] Newman,[31] Bossanyi *et al.*,[32] and further developed by Frandsen[19] and Frandsen *et al.*[33] It considers the vertical change in the natural ABL due to the increase in the surface roughness induced by clusters of large number of wind turbines. The concept of displacement height and effective surface roughness is commonly used in modeling flow through and above plant canopies.[34]

Based on momentum balance (i.e., Eq. (2) in which the "dispersive stresses" are neglected), Frandsen *et al.*[19,33] derived an expression for the wind farm induced surface roughness. Furthermore, it is postulated that there are two equilibrium layers. The first one, the "high" layer is situated above the wind-turbine canopy, with a friction velocity $u_{*\mathrm{hi}}$ (high denoted by subscript "hi"). In the case of fully developed flow of height H driven by a pressure gradient, it is expected that $u_{*\mathrm{hi}}=\sqrt{H\rho^{-1}(dp_\infty/dx)}$. At very high Reynolds number, it can also be expected that $u_{*\mathrm{hi}}\approx(-\langle\overline{u'w'}\rangle)^{1/2}$, for $H\gg z>z_h$ if

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parametrizing fluxes at the ground and neglecting horizontal variations inside the smallest near-ground computational mesh, the assumption is made implicitly that the flow is "fully developed."

At present, there is relatively little information available in literature pertaining to the detailed dynamics of a fully developed boundary layer containing obstacles representing the net effects of an array of wind turbines. The current work focuses on describing the horizontally averaged structure of such a wind-turbine array boundary layer (called WTABL from here on). Using LES, various simulations of the WTABL will be undertaken. The effects of turbines will be represented in the LES using a classical "drag disk" approach. Turbine parameters that will be explored are the streamwise and spanwise turbine spacing (s_xD and s_yD, where D is the rotor diameter), the turbine thrust coefficient C_T, and the surface roughness $z_{0,\mathrm{lo}}$ that characterizes the ground below the wind turbines. For each of the cases, we will determine the effective "wind-farm roughness" experienced by the upper ABL. For some representative cases, we will also examine the profiles of Reynolds stresses, stresses associated with mean velocity spatial variations ("dispersive stresses") and the corresponding fluxes of kinetic energy associated with the vertical structure of the flow.

In the current study, we use a pressure-gradient driven flow in a domain of a height H that is representative of the ABL (e.g., $H=1000$ m). The use of pressure-gradient forcing enables us to ensure that the mean flow is oriented perpendicular to the wind turbines. In the true ABL, the flow is forced through a pressure gradient arising from geostrophic balance that depends on the geostrophic velocity above the ABL. If this approach was used in the simulations, the resulting flow direction at hub height of wind turbines (e.g., $z_h=100$ m) would be an outcome of the simulation rather than an imposed parameter. This would cause unnecessary complications in interpreting the simulation results.

The main goals of this study, namely, to determine effective wind-farm roughness parameters and to examine the structure of exchanges in the region close to the wind turbines, are both based on the classical view of turbulent rough-wall boundary layers with "inner" and "outer" regions. The flow in the "outer region," at heights above $0.15H$–$0.2H$, is influenced by external effects such as Coriolis forces and the geometry of the domain. The inner flow, in the lower (say) 15% of the ABL, is determined by an inner length scale z_0, whose magnitude depends on the surface geometry and flow details in the immediate vicinity of the surface. In the classical view, the relationship between z_0 and geometric features of the surface is assumed to be independent of the outer region. Thus, for instance, effective roughness lengths of a particular rough surface can be measured in round pipes and one may apply the results to flow over the same type of surface when it is placed in a plane channel or developing boundary layer. Here, we will study the relationship between effective roughness height and characteristics of wind turbines (height, rotor diameter, horizontal spacings, loading factors, etc.) and argue that the same relations will hold generally independent of the outer flow conditions. Thus, the results obtained in a pressure driven boundary layer will be assumed to be applicable when the flow is forced by a geostrophic wind, for example, as long as the "inner scales," such as effective roughness height, wind-turbine height, etc., fall within the boundary layer's "inner region." This (classical) working hypothesis is limited by the fact that wind-turbine heights are close to the limits of the inner region (e.g., with hub heights and rotor diameters of 100 m, the tip of the rotor already reaches 15% up into a 1000 m high ABL), and furthermore, evidence for direct interactions between inner and outer dynamics in turbulent boundary layers has been observed.[24,25] Nevertheless, we believe the working hypothesis can be considered a good first approximation for practical applications, especially considering the fact that the effective roughness heights that will be determined in the present work will indeed be several orders of magnitudes smaller than H. For one of our wind-farm cases, we tested this hypothesis by including a simulation with a larger outer scale and found that profiles match very well in the inner layer and overlap region up to five times the hub height.

In Sec. II, concepts related to the horizontally averaged WTABL are introduced, and theoretical models for the effective roughness are reviewed. The LES technique used is described in Sec. III, while the cases considered and parameters chosen for the simulation are summarized in Sec. III C. The results are presented in Sec. IV, where some representative instantaneous distributions are shown, together with mean velocity, Reynolds shear stress, and dispersive stress distributions. Section V presents the effective roughness heights deduced from the LES. These are compared with the models described above, in Sec. VI, where also an improved model is introduced based on the insights gained from the simulations. Conclusions are summarized in Sec. VII. The Appendix describes the relationship between the simulation results with pressure gradient forcing and the case of flow forced by geostrophic wind.

II. HORIZONTALLY AVERAGED WTABL AND EFFECTIVE ROUGHNESS OF WIND FARMS

A. Horizontally averaged WTABL structure

We consider a fully developed, neutral stability, turbulent boundary layer forced in the x direction by a mean pressure gradient, in a statistically steady state. The Reynolds-averaged streamwise momentum equation then reads as

$$\bar{u}\frac{\partial\bar{u}}{\partial x}+\bar{v}\frac{\partial\bar{u}}{\partial y}+\bar{w}\frac{\partial\bar{u}}{\partial z}=-\frac{1}{\rho}\frac{dp_\infty}{dx}-\frac{\partial}{\partial x}\overline{u'u'}-\frac{\partial}{\partial y}\overline{u'v'}$$

$$-\frac{\partial}{\partial z}\overline{u'w'}+\bar{f}_x, \quad (1)$$

where the overbar denotes time averaging. Further, u, v, and w are velocity components, the streamwise direction x, spanwise direction y, and vertical direction z, and p_∞ is the averaged pressure. The fluctuating velocity is $u'=u-\bar{u}$, with similar definitions for v' and w'. Finally, $\bar{f}_x$ represents the time-averaged thrust force corresponding to the effect of the wind turbines on the horizontal momentum. It is nonzero only in regions where wind-turbine rotor disks are located.

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the wind turbines are in the boundary layer's inner region. The second "low" layer is assumed to exist below the wind-turbine array (low denoted by subscript "lo"), where the friction velocity is reduced due to the momentum lost to the wind turbines, and equals $u_{*\mathrm{lo}}=\sqrt{\tau_w/\rho}$, where τ_w is the stress at the ground. At very high Reynolds number, it can also be expected that $u_{*\mathrm{lo}}\approx(-\langle\overline{u'w'}\rangle)^{1/2}$ (for $z<z_h$). Useful estimates of these friction velocities can be made if one relates the force to the mean flow velocity at hub height. A simple model is to assume that the mean velocity in the two constant stress layers follows separate logarithmic equilibrium profiles. For the bottom and top boundary layers, one may thus write

$$\langle\bar{u}\rangle_{\mathrm{lo}}(z)=\frac{u_{*\mathrm{lo}}}{\kappa}\ln\left(\frac{z}{z_{0,\mathrm{lo}}}\right)\quad\text{for } z_{0,\mathrm{lo}}<z<z_h, \quad (5)$$

$$\langle\bar{u}\rangle_{\mathrm{hi}}(z)=\frac{u_{*\mathrm{hi}}}{\kappa}\ln\left(\frac{z}{z_{0,\mathrm{hi}}}\right)\quad\text{for } z>z_h, \quad (6)$$

where κ is the usual von Kármán constant. Now assuming that the wind turbines are exposed to a typical velocity on the order of the mean velocity at hub height, $\langle\bar{u}\rangle(z_h)$, one may write the momentum balance equation (2) as[19]

$$u_{*\mathrm{hi}}^2=u_{*\mathrm{lo}}^2+\frac{1}{2}C_T\left(\frac{\pi}{4}D^2\right)\left[\frac{u_{*\mathrm{hi}}}{\kappa}\ln\left(\frac{z_h}{z_{0,\mathrm{hi}}}\right)\right]^2\left(\frac{1}{s_xs_yD^2}\right). \quad (7)$$

Above, the horizontal spacings of wind turbines are s_xD and s_yD in the streamwise and spanwise directions, respectively, and C_T is the turbine's thrust coefficient. The above equation may be simplified to

$$u_{*\mathrm{hi}}^2=u_{*\mathrm{lo}}^2+\frac{1}{2}c_{ft}\left(\frac{1}{\kappa}\ln\frac{z_h}{z_{0,\mathrm{hi}}}\right)^2u_{*\mathrm{hi}}^2, \quad (8)$$

where a friction coefficient c_{ft} based on the horizontal surface rather than frontal area simplifies the nomenclature and is defined according to

$$c_{ft}=\frac{\pi C_T}{4s_xs_y} \quad (9)$$

(note that this definition differs from earlier ones[33] by a factor of 1/2). The approach of Frandsen *et al.*[19,33] is to solve this equation for the unknown roughness parameter $z_{0,\mathrm{hi}}$ appropriate for the layer above the wind turbine. The model still requires a relationship among $u_{*\mathrm{lo}}$ and $u_{*\mathrm{hi}}$. Neglecting the width of the wind-turbine wakes, the condition of continuity of the mean horizontally averaged velocity means equating the implied mean velocities at height z_h,

$$\langle\bar{u}\rangle_{\mathrm{hi}}(z_h)=\langle\bar{u}\rangle_{\mathrm{lo}}(z_h)\Rightarrow u_{*\mathrm{lo}}=u_{*\mathrm{hi}}\frac{\ln(z_h/z_{0,\mathrm{hi}})}{\ln(z_h/z_{0,\mathrm{lo}})}. \quad (10)$$

Substituting into Eq. (7) and solving for $z_{0,\mathrm{hi}}$ yields the Frandsen formula for the effective roughness height,

$$z_{0,\mathrm{hi}}=z_h\exp\left(-\frac{\kappa}{\sqrt{\frac{1}{2}c_{ft}+\left[\frac{\kappa}{\ln(z_h/z_{0,\mathrm{lo}})}\right]^2}}\right). \quad (11)$$

It can be seen that when $c_{ft}\to 0$, the expression tends to the unperturbed bottom surface height $z_{0,\mathrm{lo}}$.

III. LES METHODOLOGY AND CASES

A. Governing equations and LES codes

In this work, we consider flow that is not thermally stratified, driven by an imposed pressure gradient. Therefore, the LES is based on the filtered incompressible Navier–Stokes (NS) equations for neutral flows and the continuity equation, i.e.,

$$\partial_i\tilde{u}_i=0, \quad (12)$$

$$\partial_t\tilde{u}_i+\partial_j(\tilde{u}_i\tilde{u}_j)=-\partial_i\tilde{p}^*-\partial_j\tau_{ij}+f_i-\delta_{i1}\partial_1p_\infty/\rho, \quad (13)$$

where $\tilde{u}_i$ is the filtered velocity field and $\tilde{p}^*$ is the filtered modified pressure equal to $\tilde{p}/\rho+\tau_{kk}/3-p_\infty/\rho$. Further, τ_{ij} is the subgrid-scale stress term. Its deviatoric part $(\tau_{ij}-\delta_{ij}\tau_{kk}/3)$ is modeled using an eddy viscosity subgrid-scale model, as discussed further below; the trace of this term $(\tau_{kk}/3)$ is combined into the modified pressure, as is common practice in LES of incompressible flow.

The force f_i is added for modeling the effects of the wind turbines in the momentum equation (see Sec. III B). Since simulations are done at very large Reynolds numbers and the bottom surface as well as the wind-turbine effects are parametrized, viscous stresses are neglected. In the real case of wind turbines in the ABL, the flow is forced by geostrophic wind and in the outer layer is affected by Coriolis accelerations, as discussed in the Appendix. The flow changes direction near the ground, and for a given geostrophic wind direction, the turning depends on the shear stresses (momentum exchanges) at the bottom surface. Since these are not known ahead of time, and we wish to have a mean wind that is perpendicular to the wind-turbine disks in the array to be simulated, in the simulations we prefer to use forcing with an imposed pressure gradient ∂_1p_∞ in the x_1 direction. The results of the simulations, especially in the surface layer region, can still be interpreted in the context of geostrophic wind forcing, as summarized in the Appendix.

In the present study, we use two LES codes, which helps gauge the robustness of the results to details of numerical methods and implementation details. In one code (JHU-LES code), the skew-symmetric form of the NS equation is implemented. The numerical discretization follows the approach used by Moeng[35] and Albertson and Parlange,[36] which combines a pseudospectral discretization, and thus doubly periodic boundary conditions in the horizontal directions and a centered second-order finite differencing in the vertical direction. A second order accurate Adams–Bashforth scheme is used for time integration. The subgrid model used is the dynamic Smagorinsky model[37] using the Lagrangian scale-dependent version, as described in Ref. 37.

The second code (KULeuven code) also uses a pseudospectral discretization in the horizontal directions. In the

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vertical direction, a fourth-order energy-conservative finite-difference discretization is used. Time integration is performed using a classical four-stage fourth-order Runge-Kutta scheme. The subgrid-scale model is a standard Smagorinsky model with a constant coefficient $C_s=0.14$. Near the bottom surface, the Smagorinsky length scale λ ($=C_s\Delta$ far from the surface) is damped using the classic wall damping function of Mason and Thomson, i.e., $\lambda^{-n}=[C_s\Delta]^{-n}+[\kappa(z+z_{0,H})]^{-n}$, where we take $n=3$.

In both codes, the nonlinear convective terms and the SGS stress are dealiased using the 3/2 rule. Message passing interface is used to run the simulations in parallel mode, and the FFTW library is employed for Fourier transforms. The top boundary uses zero vertical velocity and zero shear stress boundary condition. At the bottom surface, we use a classic imposed wall stress boundary condition relating the wall stress to the velocity at the first grid-point using the standard log (Monin–Obukhov) similarity law

$$\tau_{xz} = -\left[\frac{\kappa}{\ln(z/z_{0,H})}\right]^2(\hat{u}^2+\hat{v}^2)^{1/2}\hat{u}, \tag{14}$$

$$\tau_{yz} = -\left[\frac{\kappa}{\ln(z/z_{0,H})}\right]^2(\hat{u}^2+\hat{v}^2)^{1/2}\hat{v}, \tag{15}$$

where the hat on $\hat{u}$ and $\hat{v}$ represents a local average obtained by filtering the LES velocity field with filter width 2Δ (see Ref. 37 for more details about such filtering).

The applied pressure gradient $\partial_1 p_\infty/\rho$ defines a reference, fixed, friction velocity $u_{*,H}$ by means of $u_{*,H}^2=H\partial_1 p_\infty/\rho$. Velocities will be scaled with $u_{*,H}$, while time scales will be scaled with $H/u_{*,H}$. Henceforth, to simplify notation, the LES filtering "tilde" will be omitted from the indicated variables.

B. Wind-turbine model

The model for the wind turbines is based on an empirical model for the total thrust force experienced by the entire wind turbine. The total disk actuator force F_t acting on the flow in the streamwise x_1 direction is modeled using the classical expression

$$F_t = -\frac{1}{2}\rho C_T U_\infty^2\frac{\pi}{4}D^2, \tag{16}$$

where C_T is the thrust coefficient and U_∞ is the "upstream" undisturbed reference velocity. However, in LES of wind-turbine arrays with significant interactions among wind turbines and wakes, this reference velocity is not readily known and would require arbitrary decisions about what upstream distance to use when specifying the velocity. This is unlike the LES of isolated turbines in Jimenez *et al.*, which had negligible interactions and in which U_∞ could be readily specified. For our simulations, it is more natural to use the velocity at the rotor disk U_d. Using classic actuator disk theory allows relating both velocities according to

$$U_\infty = \frac{U_d}{(1-a)}, \tag{17}$$

where a is the induction factor. Moreover, modeling the thrust forces acting on the fluid due to its interaction with the rotating blades requires the use of an average disk velocity. It will be evaluated from LES by averaging over the disk region, and over some period in time, yielding a velocity denoted by $\langle\overline{u}^T\rangle_d$. Then, the total thrust force can be written as

$$F_t = -\rho\frac{1}{2}C_T'\langle\overline{u}^T\rangle_d^2\frac{\pi}{4}D^2, \tag{18}$$

with the subscript d denoting an averaging over the turbine disk region and the superscript T denoting time filtering or averaging over a time scale on the order of T. Thus $\langle\overline{u}^T\rangle_d$ is the disk averaged and time-filtered velocity (further discussed below). Also, we define

$$C_T' = \frac{C_T}{(1-a)^2}. \tag{19}$$

For the Betz limit (i.e., $C_T=8/9$, and $a=1/3$), we obtain $C_T'=2$. Using typical values $C_T\approx 0.75$, and $a\approx 1/4$, which may be found in existing wind turbines, and prior LES study leads to $C_T'\approx 4/3$. In the current study, we perform LES using various C_T' values around a baseline case with $C_T'=4/3$, as will be further discussed in Sec. III C. Similar to the definition of c_{ft} [cf. Eq. (9)], we also introduce $c_{ft}'=\pi C_T'/(4s_xs_y)$.

In the JHU-LES code and the KULeuven code, two slightly different approaches are followed for the implementation of the wind-turbine forces F_t and the disk-averaged local velocity $\langle\overline{u}^T\rangle_d$. In the JHU-LES code the total force F_t is distributed among all grid points that fall into the wind-turbine disk region. This region is a circle with diameter D and centered at particular locations in which wind turbines are located. In the streamwise direction, the rotor disk region is taken as a single grid point, i.e., in a mesh region of length $\Delta x=L_x/N_x$, where L_x is the streamwise domain length and N_x is the number of grid points in that direction. The force is distributed proportional to the computational mesh frontal area that coincides with the wind-turbine disk, i.e., $\gamma_{j,k}\Delta y\Delta z$, where $\gamma_{j,k}$ is the fraction of area overlap between the cell at grid point (j,k) (positions y_j, z_k) and the circle. For the interior grid points representing meshes entirely contained inside the circle, the factor is $\gamma_{j,k}=1$. For grid points representing meshes entirely outside the circle, the factor is $\gamma_{j,k}=0$. For cells with partial overlap, the factor corresponds to the fractional area overlap.

Then, the force (per unit mass) in the streamwise direction at a given grid point (i,j,k) corresponding to positions (x_i,y_j,z_k) is given by

$$f_t(x_i,y_j,z_k) = -\frac{1}{2}C_T'\langle\overline{u}^T\rangle_d^2\frac{\gamma_{j,k}}{\Delta x}. \tag{20}$$

Finally, in the JHU-LES code, the disk-averaged local velocity $\langle\overline{u}^T\rangle_d$ is evaluated by spatial averaging over all grid points in the wind-turbine disk, and temporal averaging

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TABLE I. Summarizing parameters of the various LES cases. Between brackets is indicated which code is used: "L" refers to the KULeuven code and "J" refers to the JHU-LES code.

	s_x/s_y	s_x	$4s_xs_y/\pi$	N_t	$L_x\times L_y\times H$	$N_x\times N_y\times N_z$	$z_{0,H}$	C_T'	c_{ft}'
A1 (L)	1.5	7.85	52.36	4×6	π×π×1	128^3	10^{-4}	1.33	0.025
A2 (J)	1.5	7.85	52.36	4×6	π×π×1	128^3	10^{-4}	1.33	0.025
A3 (L)	1.5	7.85	52.36	8×6	2π×π×1	128×192×61	10^{-4}	1.33	0.025
A4 (L)	1.5	7.85	52.36	8×6	2π×π×1.5	128×192×92	10^{-4}	1.33	0.025
B (J)	1.5	7.85	52.36	4×6	π×π×1	128^3	10^{-4}	2.00	0.038
C (J)	1.5	7.85	52.36	4×6	π×π×1	128^3	10^{-4}	0.60	0.012
D (J)	1.5	7.85	52.36	4×6	π×π×1	128^3	10^{-3}	1.33	0.025
E (J)	1.5	7.85	52.36	4×6	π×π×1	128^3	10^{-2}	1.33	0.025
F (J)	1.5	7.85	52.36	4×6	π×π×1	128^3	10^{-5}	1.33	0.025
G (L)	1.5	15.7	209.4	4×3	2π×π×1	128×192×61	10^{-4}	1.33	0.006
H (L)	1.5	6.28	33.51	10×8	2π×1.07π×1	128×192×61	10^{-4}	1.33	0.040
I (L)	1.5	5.24	23.27	12×9	2π×π×1	128×192×61	10^{-4}	1.33	0.057
J (L)	2	9.07	52.36	7×7	2.02π×1.01π×1	128×192×61	10^{-4}	1.33	0.025
K (L)	1	6.41	52.36	10×5	2.04π×1.02π×1	128×192×61	10^{-4}	1.33	0.025

over a time window of $Tu_*/H=0.27$ (corresponding to $T=10$ min using possible reference dimensional values $u_*=0.45$ m/s and $H=1000$ m). The time averaging is done using a one-sided exponential time filter (first-order relaxation process).

The KULeuven code contains an alternative drag-disk force implementation, which more easily allows to change the positioning and orientation of turbines. In a first step, turbine forces are described in the turbine-rotor plane. In a second step, these forces are filtered using a Gaussian convolution filter on locations which correspond to the coordinates of the LES grid. To further detail this procedure, we introduce the coordinate system $\mathbf{y}=(y_1,y_2)$ in the turbine rotor plane, with origin in the rotor center, y_1 the horizontal, and y_2 the vertical directions. In the LES coordinate frame the rotor plane is given by coordinates $\mathbf{x}_0$ which satisfy $\mathbf{e}_\perp\cdot(\mathbf{x}_0-\mathbf{x}_H)=0$ with $\mathbf{x}_H$ as the coordinate of the rotor center and $\mathbf{e}_\perp$ a unit vector perpendicular to the rotor plane. Take $f_{y,i}(\mathbf{y})$ $(i=1,2,3)$ the turbine forces per unit mass in the turbine-rotor coordinate frame, then the filtered forces in the LES coordinate frame correspond to

$$f_i(\mathbf{x}) = Q_{ij}\mathcal{F}_{x,j}(\mathbf{x}), \tag{21}$$

where Q_{ij} is a rotation matrix, accounting for possible different orientations between the $\mathbf{y}$, and $\mathbf{x}$ coordinate frames, and $\mathcal{F}_{x,j}$ are the filtered turbine forces at the LES-grid locations $\mathbf{x}$, i.e.,

$$\mathcal{F}_{x,i}(\mathbf{x}) = \iiint G(\mathbf{x}-\mathbf{x}')\delta(\mathbf{e}_\perp\cdot(\mathbf{x}'-\mathbf{x}_H)) \times f_{y,i}(\mathbf{y}(\mathbf{x}'-\mathbf{x}_H))d^3\mathbf{x}', \tag{22}$$

where $\delta(x)$ is the Dirac function. We select a Gaussian filter with filter kernel $G(\mathbf{x})=[6/(\pi\Delta^2)]^{3/2}\exp(-6\|\mathbf{x}\|^2/\Delta^2)$, where $\Delta=1.5h$ (and h is the grid spacing) is used to avoid Gibbs oscillations on the LES grid. A similar smoothing approach was used for actuator-line representations in Ref. 10.

In the current study, turbines are always oriented perpendicular to the streamwise direction x_1, such that Q_{ij} is an identity matrix. Further, the turbine forces only include thrust effects, which are distributed constant over the turbine rotor disk with diameter D. Consequently, $f_2=f_3=0$ and $f_1=\mathcal{R}(\mathbf{x})f_{y,1}$, with $\rho f_{y,1}\pi D^2/4=F_t$ [cf. Eq. (18)], and where

$$\mathcal{R}(\mathbf{x}) = \iiint G(\mathbf{x}-\mathbf{x}')\delta(\mathbf{e}_\perp\cdot(\mathbf{x}'-\mathbf{x}_H)) \times H(D/2-\|\mathbf{y}(\mathbf{x}'-\mathbf{x}_H)\|)d^3\mathbf{x}' \tag{23}$$

is the geometrical representation of the rotor disk smoothed out into the LES domain using a Gaussian filter [and $H(x)$ is the Heaviside function].

In order to determine the disk averaged local velocity $\langle u\rangle_d$ needed for the determination of the thrust force F_t, we employ (in the KULeuven code) the geometrical rotor footprint $\mathcal{R}(\mathbf{x})$ as a weighting function for the averaging such that

$$\langle u\rangle_d = \frac{4}{\pi D^2}\iiint \mathcal{R}(\mathbf{x})\tilde{\mathbf{u}}(\mathbf{x})\cdot\mathbf{e}_\perp d^3\mathbf{x}. \tag{24}$$

Further, as in the JHU-LES code, $\langle\overline{u}^T\rangle_d$ is obtained from $\langle u\rangle_d$ by using a one-sided exponential time-filter using a time window of $Tu_*/H=0.6$.

C. Suite of LES cases

In the various simulations, we vary the resolution (given by the parameters L_x, L_y, H and N_x, N_y, N_z), the number of wind turbines (N_t), the distances among them (s_xD and s_yD), and the relative sparseness of their distribution ($S/A=4s_xs_y/\pi$), the thrust coefficient C_T' that represents the loading of the wind turbine, and the bottom surface roughness scale $z_{0,H}$. The grid spacing is uniform in all three directions. The suite of LES cases is described in Table I.

As can be appreciated from the table, the simulations are divided among the JHU-LES and KULeuven codes. Simulations with the KULeuven code focus more on variations in turbine arrangements, with different s_x-s_y combinations

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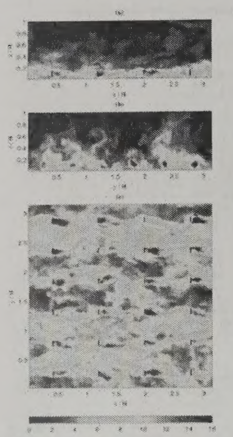

FIG. 1. (Color online) Instantaneous contours of streamwise velocity from LES of a fully developed WTABL (baseline case A2). (a) on a x-z plane cutting through the middle of a column of wind turbines. (The location of the wind turbine disks are indicated with vertical black lines). (b) On a cross-stream y-z plane at a distance ~1D downstream of a row of wind turbines. (c) On a x-y plane at a height z corresponding to hub height (the wind turbine centers).

since this is the more flexible code in terms of turbine placement on the LES grid (cf. Sec. III B). Simulations with the JHU-LES code mainly focus on $z_{0,H}$ variations since the scale-dependent Lagrangian dynamic model employed by this code is expected to better describe the flow and roughness effects near the bottom surface (cf. Sec. III A). All simulations use $C_T'=1.33$, except cases B and C, where a higher value $C_T'=2.0$ (corresponding to the Betz limit), and a lower value $C_T'=0.6$ are considered. Finally, the reference case (using $s_x/s_y=1.5$, $4s_xs_y/\pi=52.36$, $z_{0,H}=10^{-4}$, and $C_T'=1.33$) is simulated four times (cases A1, A2, A3, and A4), which allows us to assess the effect of different codes and different computational domains.

All simulations are initialized with a startup run of 60

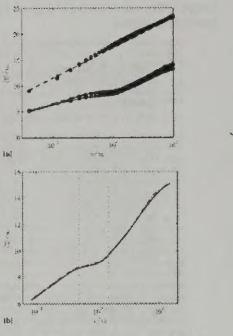

FIG. 2. (a) Mean velocity profile of the baseline cases A1 (- -), A2 (—), and A3 (dash-dotted line), comparing the effects of slightly different numerical implementation of the LES, subgrid models, drag disk force implementation, and domain and grid selections. The top dashed line is $\kappa^{-1}\ln(z/z_0)$, the log-law behavior expected without wind turbine models. (●, ■) cases A1 and A2 without turbine loads. (b) Mean velocity profile of cases A3 (dash-dotted line) and A4 (full line). The vertical dotted lines mark the bottom and top of the turbine rotor planes.

nondimensional time units (where the dimensionless time is in units of H/u_*), which was found sufficiently long to achieve statistical stationarity. Subsequently, statistics are accumulated over 60 (L) and 15 (J) nondimensional time units.

While the number of turbines (e.g., 4×6) and the size of the domain are not sufficient by themselves to lead to a "fully developed condition" (cf. discussion in Sec. I), in combination with the periodic boundary conditions in the horizontal plane and the very long simulation time, the simulated flow conditions can be considered effectively fully developed.

A sample of instantaneous results is shown in Figs. 1(a)–1(c). They are contour plots of streamwise velocity in three perpendicular planes. The location of the wind turbine disks are indicated with black lines. As seen in Fig. 1(a), which shows x-z plane cutting through the middle of a column of wind turbines, the slow-moving fluid in the wakes recovers significantly before reaching the next turbines. Internal boundary-layer type structures above the wind turbines are also visible. Figure 1(b) shows instantaneous cuts through a cross-stream y-z plane at a distance ~1D downstream of a row of wind turbines. The array has significant

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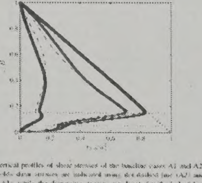

FIG. 3. Vertical profiles of shear stresses of the baseline cases A1 and A2. The Reynolds shear stresses are indicated using dot-dashed line (A2) and asterisks (A1), while the dispersive stresses are denoted with dashed line (A2) and open diamonds (A1). Their respective sum is shown by a solid line (A2) and open circles (A1).

effects even on the high regions of the boundary layer, where strong ejection and sweep motions are visible. The horizontal cut shown in Fig. 1(c), x-y plane, is also through the wind-turbine centers. Here, the significant meandering of wind-turbine wakes is clearly visible. It is well known that such meandering increases significantly the loads on wind-turbine structures and causes additional (generally unwanted) variability.

IV. VERTICAL PROFILES OF HORIZONTAL AVERAGES

Figure 2(a) shows the mean velocity profile of the baseline cases A1, A2, and A3, comparing the effects of slightly different numerical implementation of the LES, subgrid model, drag-disk force implementation, and effects of domain and grid selection. The velocity is normalized with the imposed pressure gradient based parameter u_*. Henceforth, u_* and $u_{*,H}$ used in the prior sections will be used interchangeably. Also shown in the figure are the results from LES without any wind turbines present, showing agreement with the log law behavior near the surface. As can be appreciated, the effects of the computational domain and grid (compare cases A1 and A3) are small. Differences between the two LES codes (compare cases A1 and A2) are a bit more pronounced; nevertheless, the profiles compare quite well. There are some minor differences near the ground surface. There, the Smagorinsky model results in slightly higher velocity gradient (and thus a slightly higher velocity at the turbine height), compared to the scale-dependent model. The differences near the wind-turbine region may also be due to the small differences in the implementation of the drag force and how it is distributed among the grid points. As a result, there are some differences also at $z/H=1$, reflecting small differences in the overall effective roughness characteristics computed from cases A1–A3. We believe this level of difference is a useful indication of the level of differences to be expected from modeling implementations in a complex flow simulation.

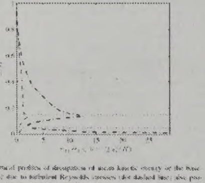

FIG. 4. Vertical profiles of dissipation of mean kinetic energy of the baseline case A2 due to turbulent Reynolds stresses (dot-dashed line; also production of turbulent kinetic energy) and due to dispersive stresses (dashed lines).

In Fig. 2(b), mean velocity profiles from cases A3 and A4 are presented, comparing the effect of a different height of the ABL. Case A4 consists of the same turbine loading, and pressure gradient as case A3, but with a height of $H=1.5$. Hence, the imposed pressure-gradient based parameter u_* is $(1.5)^{1/2}$ higher for case A4. The mean velocity profiles in Fig. 2(b) show very good agreement when normalized using inner scales u_*, and z_0, and profiles match up to a height of approximately $5z_h$. This supports our hypothesis that the wind turbines mainly interact with the inner region of the boundary layer, and that results are independent of the outer region effects such as boundary layer thickness, etc. (cf. discussion in Sec. I).

The Reynolds shear stress $-\langle\overline{u'w'}\rangle$ and dispersive shear stress profiles $-\langle\overline{u}''\overline{w}''\rangle$ of the baseline runs A1 and A2 are shown in Fig. 3. The results are shown as lines (case A2, JHU code) and symbols (case A1, KULeuven code). The Reynolds shear stresses are larger, but the dispersive stresses cannot be neglected. They range between 15% and 35% of the stress depending on height. Their sum is shown as solid lines (JHU code) and hollow circles (KULeuven code) and shows the expected linear behavior until close to the top of the wind-turbine region (delimited by the horizontal dotted lines between $z/H=0.05$ and $z/H=0.15$). In this region, the drag due to the turbines begins to deplete the momentum fluxes until below the wind-turbine region. Close to the ground, the subgrid stress provides the remaining momentum transport.

Next, we study the vertical structure of the flow from the point of view of kinetic energy [see Eq. (5)]. Figure 4 shows the profiles of kinetic energy dissipation caused by the turbulence $(-\langle\overline{u'w'}\rangle\partial\langle\overline{u}\rangle/\partial z)$ and by the dispersive stresses $(-\langle\overline{u}''\overline{w}''\rangle\partial\langle\overline{u}\rangle/\partial z)$. This is the rate at which kinetic energy of the horizontally averaged mean flow is being lost due to production of turbulent kinetic energy and due to mixing of spatial variations in the time-averaged mean velocity distribution, respectively. They do not necessarily need to be positive, especially the latter. Without wind turbines the maximum generation of turbulent kinetic energy takes place very near the ground and decreases rapidly with increasing

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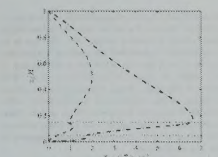

FIG. 5. Vertical profiles of fluxes of kinetic energy for the baseline case A2 due to turbulent Reynolds stresses (dot-dashed line) and due to dispersive stresses (dashed line).

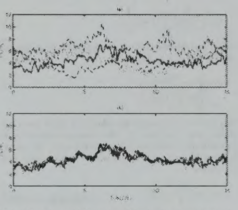

FIG. 6. Extracted power density by four different turbines in simulation A2. In (a) four different WTs corresponding to the same row, but different columns: (c1,r1) solid line, (c2,r1) dashed line, (c3,r1) dotted line and (c5,r1) dot-dashed line. In (b) four different WTs all aligned in the same column, but from different rows: (c1,r1) solid line, (c1,r2) dashed line, (c1,r3) dot-dashed line and (c1,r4) dotted line.

height. When introducing wind turbines a second peak occurs at the top of the wind-turbine region, where large turbulence production is due to the peak of Reynolds stresses there.

Figure 5 shows the profiles of flux of kinetic energy. The dispersive fluxes, $-\langle\bar{u}''\bar{w}''\bar{u}''\rangle$, are associated with the mean velocity's spatial variations and include effects coming from wake recovery, etc. As can be seen, in this case they are, on the average, smaller (but not negligible) when compared to the kinetic energy fluxes caused by the turbulence, $-\langle\overline{u'w'}\rangle\langle\bar{u}\rangle$. It is of interest to compare these results with the mechanical power extracted by the wind turbines.

In recent wind tunnel experiments[29] that measured directly the power extracted by model wind turbines in a 3×3 model wind farm, velocity field measurements showed that the vertical fluxes of kinetic energy were of the same order of magnitude as the power extracted by the wind turbines. A similar analysis can be done based on the LES results. For this purpose, we integrate Eq. (3) between $z_h-D/2$ and $z_h+D/2$ and obtain

$$W_p+\Phi(z_h+D/2)-\Phi(z_h-D/2)=\mathcal{D}+W_t, \tag{25}$$

where

$$W_p=-\frac{D}{\rho}\langle\bar{u}\rangle_D\frac{dp_\infty}{dx} \tag{26}$$

is the forcing power due to the applied pressure gradient in the wind-turbine region,

$$\Phi(z)=-(\langle\overline{u'w'}\rangle\langle\bar{u}\rangle+\langle\bar{u}''\bar{w}''\bar{u}''\rangle) \tag{27}$$

is the total flux of kinetic energy by turbulence and dispersive stresses, and

$$\mathcal{D}=\int_{z_h-D/2}^{z_h+D/2}-(\langle\overline{u'w'}\rangle+\langle\bar{u}''\bar{w}''\rangle)\frac{\partial\langle\bar{u}\rangle}{\partial z}dz \tag{28}$$

is the dissipation term integrated over the wind-turbine area. The last term W_t is defined as

$$W_t=-\langle\bar{u}\rangle_D\frac{\overline{F_t}/\rho}{s_xs_yD^2}, \tag{29}$$

where $\langle\bar{u}\rangle_D$ is the time and horizontally averaged mean flow velocity $\langle\bar{u}\rangle$, also averaged over the WT's vertical layer. This is subtly different from the power "extracted" by the wind-turbine model, which is obtained by time averaging the mechanical power extracted according to

$$\overline{\mathcal{P}}_t=\frac{1}{N_t}\sum_{k=1}^{N_t}\bar{P}_k,\quad \text{where } P_k=\left(\frac{-F_t\langle\tilde{u}^T\rangle_d}{\rho s_xs_yD^2}\right)_k \tag{30}$$

is the instantaneous power extraction, and $\overline{\mathcal{P}}_t$ includes additional averaging over the number of wind turbines N_t in the computational domain ($N_t=24$ for case A2). Figure 6 shows the time series for P_k for several of the wind turbines. The four turbines shown in the top Fig. 6(a) are in different columns, i.e., they are not downstream from each other. There is significant spatial variability of the extracted power between WTs of different columns. This is consistent with the significant spatial variations of the velocity field seen in the visualizations in Fig. 1. Conversely, the wind turbines in the same column (downstream of each other) shown in Fig. 6(b) are highly correlated. The time average value over all wind turbines has been evaluated and is approximately $\overline{\mathcal{P}}_t/u_*^3\approx4.93$. Next, we compare this value with the terms in the horizontally averaged energy equation discussed above.

From Fig. 5, it is evident that the difference in the kinetic energy fluxes between the top and bottom heights of the turbine region is $\Delta\Phi/u_*^3\sim5.4$. To evaluate W_p, we note that the mean velocity in the wind turbine region (from integrating the mean velocity in the wind-turbine region) is $\langle\bar{u}\rangle_D/u_*\sim8.5$. Therefore, the pressure forcing term is $W_p/u_*^3\approx D/H\times8.5\approx0.85$. From Fig. 4 and by integrating Eq. (28), a value $\mathcal{D}/u_*^3\sim0.68$ is obtained for the dissipation

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of mean kinetic energy [we remark that W_t is also evaluated and results in $W_t\sim5.7u_*^3$, which as would be expected closes the power budget (to within 2%, the remaining variation being attributed to slight lack of full statistical convergence)]. Note that W_t differs from $\overline{\mathcal{P}}_t$ since $\langle\bar{u}\rangle_D\neq\langle\tilde{u}^T\rangle_d$. The difference in power terms is associated with the kinetic energy associated with spatial inhomogeneity of the mean flow in the horizontal direction.

The most interesting comparison to make is between the power extracted at the wind turbines $\overline{\mathcal{P}}_t$ and the vertical flux of kinetic energy Φ. As can be appreciated, they are of the same order of magnitude, $\overline{\mathcal{P}}_t$ being about 90% of $\Delta\Phi$ (and 75% of Φ on top of the wind turbines). From these numbers, it is clear that in the fully developed WTABL, the way the kinetic energy "arrives" at the wind turbines is by means of turbulence-facilitated vertical fluxes.

A further remark is needed on the relationship between the computed $\overline{\mathcal{P}}_t$ and the mechanical power available at the shaft on a real wind turbine. The mechanical power which can be converted to electricity rather must be expressed using the power coefficient C_P (or C_P' when using the disk velocities instead of U_∞). Only in the absence of friction does C_P' correspond to C_T' (with a maximum corresponding the Betz limit,[2] in which case $C_T'=C_P'=2.0$, which corresponds to the well-known values $C_P=16/27$ and $C_T=8/9$). In reality, the drag on the turbine blades plays an important role, which mainly effects the torque, such that C_P' is in practice significantly lower than C_T' (cf. Ref. 45). The losses related to these drag effects result into small-scale turbulence in the wake of the turbine blades (typically situated in the subgrid scales of our LES), which is eventually dissipated into heat.

V. MEASURED EFFECTIVE ROUGHNESS AND FRICTION VELOCITY

In this section we evaluate the effective roughness length $z_{0,\mathrm{hi}}$ for all the cases simulated to help develop parametrizations that may be used in very large-scale simulations of wind-turbine arrays. First, Figs. 7(a)–7(c) show a collection of different mean velocity profiles for several of the cases with different geometrical loading $4s_xs_y/\pi$ [Fig. 7(a)], aspect ratios of the turbine placement s_x/s_y [Fig. 7(b)], and different ground roughness [Fig. 7(c)]. Also shown are log-law approximations through a region above and below the wind turbines. The roughness length ($z_{0,\mathrm{hi}}$) is obtained from the measured mean velocity profile shapes above the wind-turbine region. As can be seen in Fig. 7, a good logarithmic behavior is visible there in most of the cases. Thus good results for $z_{0,\mathrm{hi}}$ can be obtained simply by using a single velocity value at a height of $2z_h=0.2H$. The expression used is $\langle\bar{u}\rangle(2z_h)=(1/\kappa)u_{*\mathrm{hi}}\log(2z_h/z_{0,\mathrm{hi}})$, where $\langle\bar{u}\rangle(2z_h)$ is obtained from the LES and $z_{0,\mathrm{hi}}$ is obtained by solving this equation using $\kappa=0.4$. The results for the roughness $z_{0,\mathrm{hi}}$ are also reported in Table II. Attempts to fit the results using the additional parameter of a "displacement height" did not lead to meaningful improvements. We conclude that for wind farms (unlike dense plant canopies) if a displacement length exists, it will tend to be very small.

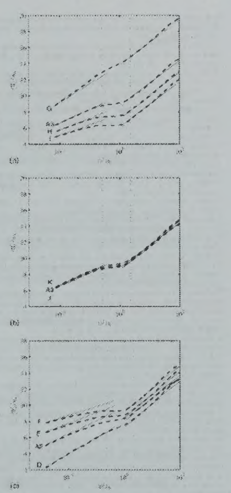

FIG. 7. Mean velocity profiles for wind farms with different parameters. (a) Results for varying geometrical loading, with $4s_xs_y/\pi=200$ (case G), $4s_xs_y/\pi=52$ (case A2), $4s_xs_y/\pi=33$ (case H), and $4s_xs_y/\pi=23$ (case I). (b) Results with varying aspect ratios $s_x/s_y=2$ (case J), $s_x/s_y=1.5$ (case A3), and $s_x/s_y=1$ (case K). (c) Simulations results for different surface roughnesses $z_{0,\mathrm{lo}}=10^{-5}$ (case D), $z_{0,\mathrm{lo}}=10^{-4}$ (case A2), $z_{0,\mathrm{lo}}=10^{-3}$ (case E), and $z_{0,\mathrm{lo}}=10^{-2}$ (case F). In gray, log profiles, below the turbines (near the bottom, $(1/\kappa)\log(z/z_{0,\mathrm{lo}})$) above the turbines ($(u_{*\mathrm{hi}}/u_*)\kappa^{-1}\log(z/z_{0,\mathrm{hi}})$); values for $u_{*\mathrm{hi}}$ and $z_{0,\mathrm{hi}}$ are listed in Table II. A detailed overview of the different cases is summarized in Table I.

From Fig. 7, it is appreciated that the geometrical loading, and the roughness of the ground surface have a dominant effect on the wind profiles in the boundary layer, and the effective roughness length $z_{0,\mathrm{hi}}$ observed by the higher layers in the WTABL. Also the variation in C_T' (results not shown in the figure) has an important effect. The effects of the aspect ratio s_x/s_y are an order of magnitude lower. The effect of s_x/s_y on the power extracted from the WTABL also remains below 10%. Even though these differences, and geometrical-placement optimizations, may be somewhat relevant from the point of view of practical siting of wind turbines within an array, we will focus more on variations in $z_{0,\mathrm{lo}}$, $4s_xs_y/\pi$, and C_T' for the remainder of this work since they have a much larger impact on $z_{0,\mathrm{hi}}$ and on the horizontally averaged structure of the flow.

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TABLE II. Effective roughness heights and friction velocities as determined from LES for the different cases.

	$z_{0,\mathrm{hi}}/H$	$u_{*\mathrm{hi}}/u_*$	$u^{ts}_{*\mathrm{lo}}/u_*$
A1 (1)	3.4×10^{-2}	0.58	0.55
A2 (1)	4.00×10^{-2}	0.56	0.51
A3 (1)	3.2×10^{-2}	0.58	0.54
B (2)	5.2×10^{-2}	0.54	0.47
C (2)	1.7×10^{-2}	0.66	0.64
D (2)	5.5×10^{-3}	0.69	0.63
E (3)	3.4×10^{-2}	0.45	0.39
F (3)	2.6×10^{-2}	0.38	0.33
G (1)	6.41×10^{-2}	0.81	0.33
H (1)	5.8×10^{-2}	0.50	0.47
I (1)	8.9×10^{-2}	0.44	0.42
J (1)	3.2×10^{-2}	0.57	0.53
K (1)	2.9×10^{-2}	0.58	0.54

Of considerable interest for further comparison with models for $z_{0,\mathrm{hi}}$ in the next section, is also the value obtained for the friction velocity $u_{*\mathrm{lo}}$ below the wind turbines. It is obtained based on the definition suggested in Sec. II B, namely, as $u_{*\mathrm{lo}}=\sqrt{\langle\overline{\tau_w}\rangle}$, where $\langle\overline{\tau_w}\rangle$ is the time and plane averaged wall shear stress applied in the LES [see Eq. (14)]. The results are shown in Table II. For comparison, it is also of interest to report a friction velocity obtained from the total stress curves at the bottom of the wind-turbine region, i.e.,

$$u^{ts}_{*\mathrm{lo}}=\sqrt{-(\langle\overline{u'w'}\rangle+\langle\bar{u}''\bar{w}''\rangle)_{z_h-D/2}}. \tag{31}$$

These stresses are readily obtained from the LES. For instance, in Fig. 8 the total shear stress, dispersive stress, and Reynolds stress profiles are shown for two of the cases (F and D). Large differences exist on the dispersive and Reynolds stresses. Their sum allows a consistent estimation of $u^{ts}_{*\mathrm{lo}}$, and the results are listed in detail in Table II. In general, we find that $u^{ts}_{*\mathrm{lo}}\approx u_{*\mathrm{lo}}$ based on the wall stress, to within about 10%–15% in most cases.

Using the values for the effective roughness $z_{0,\mathrm{hi}}$ and the lower friction velocity $u^{ts}_{*\mathrm{lo}}$ in Table II, we now evaluate different theoretical models for the effective roughness in Sec. VI.

VI. DISCUSSION: COMPARISON WITH MODELS

In this section we gauge the accuracy of the existing models for effective roughness heights described in Sec. II B associated with wind turbine arrays. The predictions are evaluated using Eqs. (4) and (11) using the parameters appropriate for each case. The results of the comparison are presented in several forms. We show all results in compact form in Fig. 9 by plotting the ratio of model predicted roughness ($z^{\mathrm{model}}_{0,\mathrm{hi}}$) and the roughness obtained from LES ($z^{\mathrm{LES}}_{0,\mathrm{hi}}$, taken as the "correct" measured value). The results for each case are shown as function of the LES-predicted effective roughness.

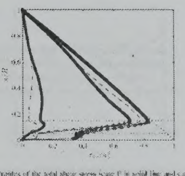

FIG. 8. Profiles of the total shear stress (case F in solid line and case D in open circles), dispersive stress (dot-dashed line for case F and asterisks for D), and Reynolds stress (dashed line for case F and open diamonds for case D).

It can be seen from this figure that the Lettau formula, which does not depend upon the bottom surface roughness nor the thrust coefficient (assuming one does not adjust the coefficient 1/2) is less accurate than the Frandsen formula, especially at high effective roughness lengths. However, even the Frandsen formula involves significant discrepancies (typically a factor of 2).

Based on the results of the simulation, a more accurate model may be suggested, in which the condition [Eq. (10)] is replaced by the assumption that there is a third (middle) logarithmic layer in between $z_h-D/2$ and $z_h+D/2$. For most of the LES cases the slope of the mean velocity profile there is almost zero. However, for the most lightly loaded WTABLs with sparse arrangements (e.g., case G) the slope is larger. The velocity at turbine height z_h may be estimated by

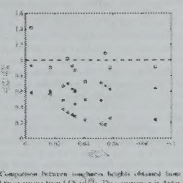

FIG. 9. Comparison between roughness heights obtained from models ($z^{\mathrm{model}}_{0,\mathrm{hi}}$) and those arising from LES ($z^{\mathrm{LES}}_{0,\mathrm{hi}}$). The comparison includes the Lettau formula (open triangles), the original Frandsen formula (stars), and the proposed modified formula (open circles) (see Eq. (39)).

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taking the value below the turbine region and adding the logarithmic slope multiplied by the (logarithmic) distance to the wind-turbine height,

$$\langle\bar{u}\rangle_h(z_h)\approx\langle\bar{u}\rangle_h(z_h-D/2)+\frac{d\langle\bar{u}\rangle_h}{d\ln z}\times\ln\left(\frac{z_h}{z_h-D/2}\right). \tag{32}$$

The logarithmic derivative $d\langle\bar{u}\rangle_h/d\ln z$ is the slope (in the lin-log plot) of the profile within the wind-turbine region. Its value will be determined next, and it depends critically upon the mixing of momentum in the wind-turbine region. We model its value by assuming an eddy viscosity behavior,

$$\nu_T\frac{d\langle\bar{u}\rangle_h}{dz}=u_*^2\rightarrow z\frac{d\langle\bar{u}\rangle_h}{dz}=\frac{d\langle\bar{u}\rangle_h}{d\ln z}=\frac{zu_*^2}{\nu_T}. \tag{33}$$

In the region outside the direct influence of the wind turbines, one expects the eddy viscosity to be $\nu_T=\kappa u_*z$. However, in the wind-turbine region it must be augmented due to the increased turbulence levels there caused by the wakes that are themselves caused by the momentum defect associated with the wind turbines. The momentum defect caused by the wind turbines is proportional to $\frac{1}{2}c_{ft}[\langle\bar{u}\rangle(z_h)]^2$, from which a turbulence velocity scale may be estimated as $\sqrt{\frac{1}{2}c_{ft}}\langle\bar{u}\rangle(z_h)$. Using the wake length-scale D, a "wake augmented eddy viscosity" can then be estimated as

$$\nu_T\approx\kappa u_*z+\sqrt{\frac{c_{ft}}{2}}\langle\bar{u}\rangle D. \tag{34}$$

Replacing into Eq. (33) and forming the logarithmic derivative gives

$$\frac{d\langle\bar{u}\rangle_h}{d\ln z}=\frac{u_*}{\kappa}\frac{1}{1+\nu_w^*}, \tag{35}$$

where ν_w^* is a nondimensional "wake eddy viscosity" defined as

$$\nu_w^*=\frac{\sqrt{\frac{1}{2}c_{ft}}\langle\bar{u}\rangle D}{\kappa u_*z} \tag{36}$$

and where the value of z is taken to be the value at hub height. At this stage, the condition that the velocity be continuous at $z=z_h$ may be written as

$$\langle\bar{u}\rangle_h(z_h-D/2)+\frac{d\langle\bar{u}\rangle_h}{d\ln z}\times\ln\left(\frac{z_h}{z_h-D/2}\right)=\langle\bar{u}\rangle_h(z_h+D/2)+\frac{d\langle\bar{u}\rangle_h}{d\ln z}\times\ln\left(\frac{z_h}{z_h+D/2}\right). \tag{37}$$

In evaluating $d\langle\bar{u}\rangle_h/d\ln z$, we use Eq. (35) but in the left hand side of the equation above we use $u_{*\mathrm{lo}}$ as the appropriate friction velocity (momentum flux) for the lower half of the wind-turbine region, while $u_{*\mathrm{hi}}$ is used for the upper half in evaluating the right hand side of the above equation. The use of the hi and lo friction velocities (instead of perhaps more accurate intermediate values) is dictated by the desire to maintain simplicity in the resulting expressions (see below). Also, the eddy-viscosity assumption is highly approximate anyhow. The relationship between friction velocities can then be written as

$$u_{*\mathrm{lo}}=u_{*\mathrm{hi}}\frac{\ln\left[\frac{z_h}{z_{0,\mathrm{hi}}}\left(1+\frac{D}{2z_h}\right)^{\nu_w^*/(1+\nu_w^*)}\right]}{\ln\left[\frac{z_h}{z_{0,\mathrm{lo}}}\left(1-\frac{D}{2z_h}\right)^{\nu_w^*/(1+\nu_w^*)}\right]}. \tag{38}$$

Replacing this into the momentum balance and solving for $z_{0,\mathrm{hi}}$ yields

$$z_{0,\mathrm{hi}}=z_h\left(1+\frac{D}{2z_h}\right)^{\nu_w^*/(1+\nu_w^*)}\exp\left(-\left[\frac{c_{ft}}{2\kappa^2}+\left(\ln\left[\frac{z_h}{z_{0,\mathrm{lo}}}\left(1-\frac{D}{2z_h}\right)^{\nu_w^*/(1+\nu_w^*)}\right]\right)^{-2}\right]^{-1/2}\right). \tag{39}$$

In the limit $\nu_w^*\approx0$, one recovers the Frandsen model since the additional mixing in the wake is neglected. This is appropriate for very sparsely distributed or weakly loaded wind-turbine arrays. The other limit, $\nu_w^*\rightarrow\infty$, is equivalent to a perfectly mixed, constant mean velocity layer across the wind-turbine region.

To complete the model, one needs to prescribe ν_w^*. To obtain a numerical value that maintains explicit dependence on c_{ft}, we choose $D\approx z_h$ and use $\langle\bar{u}\rangle/u_*\approx\kappa^{-1}\ln(z_h/z_0)$. Taking a representative value $z_h\sim100$ m and $z_0\sim1$ m (of course, this could be improved through subsequent iterations by setting $z_0\approx z_{0,\mathrm{hi}}$) yields $\langle\bar{u}\rangle/u_*\approx2.5\ln(100)\approx11$. Therefore, for $\kappa=0.4$,

$$\nu_w^*\approx28\sqrt{\tfrac{1}{2}c_{ft}}. \tag{40}$$

In order to verify the merits of this simple model for the wake viscosity, in Fig. 10 we show the measured wake viscosity for different c_{ft}' values obtained from the LES mean velocity gradient at hub-height according to [see also Eq. (33)]

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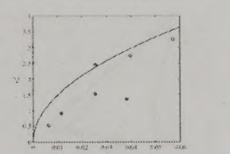

FIG. 10. Wake eddy viscosity ν_w^* obtained from LES (○) using the measured mean velocity gradient at hub height, compared to the model of Eq. (40) (—), for different c_{ft} values: (○) variation in c_{ft} by varying the geometric loading $4s_x s_y/\pi$ (cases G, A3, H, and I); (●) variation in c_{ft} by varying C_T' (cases C, A2, and B).

$$\nu_w^* = \frac{u_{*hi}}{\kappa z_h \, \partial \bar u/\partial z|_{z=z_h}} - 1. \tag{41}$$

The mean velocity gradient at hub height is obtained from the LES mean velocity profile using finite difference across the corresponding grid points at z_h. This "measured" wake viscosity from the LES is compared in Fig. 10 to the simple model of Eq. (40). As may be appreciated, the model provides a reasonable level of agreement with the wake viscosity obtained from LES. Some discrepancies may be observed, in particular, for case B (with $C_T'=2$, and $c_{ft}=0.038$). This may be related to the evaluation of the mean velocity derivative, a property that tends to be susceptible to numerical and modeling errors, but apart from that, this also illustrates the accuracy limitations one might expect from the rather crude estimation used for ν_w^*. Nevertheless, we find the proposed estimation of ν_w^* of sufficient accuracy for the purpose of developing the simplified roughness model, as further addressed next.

Finally, the effective roughness length scale may now be obtained from Eqs. (39) and (40). The results are presented in Fig. 9. As can be seen, the agreement with the LES data of the new model is significantly improved over the prior models. The comparison is presented in a different form in Figs. 11(a) and 11(b). In Fig. 11(a), the effective roughness is presented as a function of c_{ft} for fixed $z_{0,lo}$. As can be seen, the agreement of the new model with the LES data is quite good. Moreover, Fig. 11(b) shows the values as a function of $z_{0,lo}$ for a fixed value of c_{ft}. The agreement of the new model with the LES data is reasonable, but should be further improved.

Figure 12 shows a comparison between bottom friction velocities obtained from simple models (u_{*lo}^{mod}) and those arising from LES (u_{*lo}^{LES}) shown in Table II. The comparison includes the original Frandsen formula (stars) and the proposed modified Frandsen formula (open circles). The Lettau approach does not provide a prediction for this friction velocity. We conclude, in terms of predicting the bottom stress, that both the original Frandsen formula and the modified model provide a good estimate of the bottom friction velocity. These values are of great importance in quantifying mean surface transport properties below wind turbine arrays.

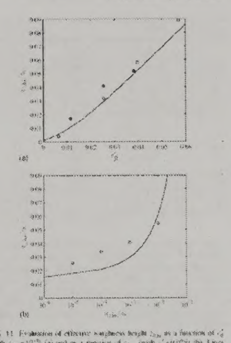

FIG. 11. Evolution of effective roughness height $z_{0,hi}$ as a function of c_{ft} (with $z_{0,lo}=10^{-4}$) (a) and as a function of $z_{0,lo}$ (with $c_{ft}=0.0250$) (b). Lines correspond to the modified formula for $z_{0,hi}$. Symbols correspond to LES evaluations. In (a): (○) variation in c_{ft} by varying the geometric loading $4s_x s_y/\pi$ (cases G, A3, H, and I); (●) variation in c_{ft} by varying C_T' (cases C, A2, and B).

VII. CONCLUSIONS

The present simulation study has focused on the "fully developed wind-turbine array boundary layer." This concept becomes relevant for wind farms whose length exceeds the height of the ABL by over an order of magnitude. In this asymptotic regime, changes in the streamwise direction can be neglected and the relevant exchanges occur in the vertical direction. A suite of LES in which wind turbines are modeled using the classic drag disk concept have been performed in order to quantify the vertical transport of momentum and kinetic energy across the boundary layer. The focus of the present paper is on horizontally averaged statistics. The import of vertical transport of kinetic energy due to turbulence and mean flow correlations is quantified. It has been shown that the vertical fluxes of kinetic energy are of the same order of magnitude as the power extracted by the wind turbines. Unlike the case of isolated or limited number of wind turbines, in a large array ultimately the kinetic energy must be extracted via vertical fluxes from the faster moving flow above the wind-turbine region.

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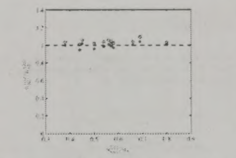

FIG. 12. Comparison between bottom friction velocities obtained from simple models (u_{*lo}^{mod}) and those arising from LES (u_{*lo}^{LES}). Stars: the original Frandsen formula. Open circles: the proposed modified Frandsen formula.

Present results have been also compared with models for effective roughness length scales. The fundamental assumption of the Frandsen (1992) approach, namely, the existence of two log laws above and below the wind-turbine region, has been verified in the LES results. Based on the observed trends in mean velocity across the wind-turbine region, a modified model is proposed showing improvement in the predicted effective roughness height.

It is useful to remark that the LES results and the proposed modified Frandsen formula for $z_{0,hi}$ yield roughness heights that are larger than values predicted by the original Frandsen formula, or those often employed in practice for wind farm modeling. For instance, Ref. 23 used $z_{0,hi}=0.8$ m, i.e., 0.8% of hub height, for $z_h=100$ m. For the range of realistic C_T and wind turbine spacings considered in our LES, the obtained values were centered (on a log scale) around 2%–3% of z_h, i.e., 2–3 m for a 100 m height wind turbine, i.e., quite a bit larger than 0.8 m. Of course, when predicting wind reduction factors with geostrophic forcing (see the Appendix), the sensitivity of predicted hub height velocity is relatively weak stemming from the logarithmic dependence and from the ABL height adjustments that occurs with the increased turbulence levels. However, when cubing the velocity to evaluate effects on power, the effect of the increased $z_{0,hi}$ can be significant. Thus, for the strongly loaded cases with smaller spacings we believe that the proposed modification to the Frandsen formula is important. The associated insights may also lead to a better understanding of the commonly observed "wind-farm underperformance," which is often attributed to poorly understood wake effect in an ABL environment.

The result of this study was obtained using LES with a drag disk model for the effects of wind turbines. Naturally, more detailed modeling including moving blades etc. would be more accurate, but then covering the entire boundary layer with multiple wind turbines would not be practical, especially when one wishes to compute a suite of different cases with varying parameters, etc. We point out that ongoing experimental measurements in a wind tunnel, in which model wind turbines are used that include moving blades, etc., confirm the general trends for the horizontally averaged profiles of mean velocity and Reynolds stresses observed in the present simulations (although they differ in some details since the experiments are not in the fully developed regime). Overall, we believe that the "drag disk" approach captures the main aspects of the wind-turbine boundary layer interactions. Another approximation used here is the pressure-gradient forcing. As discussed in the Appendix, the present results can be used in the context of geostrophic wind forcing as well. Future studies will focus on the spatial structure of the individual wakes within the WTABL, as well as on additional effects from thermal stratification.

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APPENDIX: IMPLICATIONS OF PRESSURE GRADIENT VERSUS GEOSTROPHIC WIND FORCING

Consider a classic boundary layer below the geostrophic wind, in which the surface layer direction is such that the flow there is in the x-direction. Following Tennekes and Lumley[47] (p. 163), in the streamwise direction the Reynolds equation and classic similarity analysis lead to the inner-layer solution

$$\frac{\bar u(z)}{u_*} = \frac{1}{\kappa}\ln\left(\frac{z}{z_0}\right) \tag{A1}$$

and the outer layer solution

$$\frac{\bar u(z) - U_G}{u_*} = \frac{1}{\kappa}\ln\left(\frac{zf}{u_*}\right) + C, \tag{A2}$$

where

$$f = 2\Omega \sin\phi \tag{A3}$$

is the Coriolis parameter. For $\Omega = 2\pi/(24\times 3600\ \mathrm{s}) = 7.27\times10^{-5}$ 1/s, and, e.g., at 40 degree latitude, we get $f=9.34\times10^{-5}$ 1/s. In the matching range, both velocities $\bar u(z)$ are equal and this yields the relation between U_G and u_*,

$$\frac{U_G}{u_*} = \frac{1}{\kappa}\ln\left(\frac{u_*}{fz_0}\right) - C. \tag{A4}$$

The constant $C\approx 4$ according to Tennekes and Lumley.[47] Frandsen *et al.*[33] quoted a value of $A=1.8$, which is related to C according to $A=\kappa C$ and gives $C=4.5$. This is an implicit equation for u_*. Following the suggestion used in Ref. 33 for the full geostrophic velocity, but here only for the U_G component, a useful (implicit) approximation of Eq. (A4) may be proposed

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$$U_G = \frac{u_*}{\kappa}\left[\ln\left(\frac{U_G}{fz_0}\right) - C_2\right], \tag{A5}$$

and we find that this works well for $C_2=4.5$. From this, we can now solve for u_* and obtain

$$u_* = \frac{\kappa U_G}{\left[\ln\left(\frac{U_G}{fz_0}\right) - C_2\right]}. \tag{A6}$$

Thus if we wish to match the velocity far above the wind-turbine array to a given U_G, this expression allows us to determine the corresponding u_* for any given z_0. In order to find at what height, $z=H_G$, the mean velocity merges with U_G, we use

$$0 = \frac{1}{\kappa}\ln\left(\frac{H_G f}{u_*}\right) + C, \tag{A7}$$

and obtain

$$H_G = \exp(-\kappa C)\frac{u_*}{f} \sim 0.16\frac{u_*}{f}. \tag{A8}$$

For typical dimensional values of u_* (say, $u_*=0.45$ m/s) and $f=9.34\times10^{-5}$ 1/s, this yields $H_G=770$ m, comparable to the domain size usually assumed. The corresponding value of U_G/u_* obtained from Eq. (A4) is $U_G/u_*=22.5$, which is $U_G=10$ m/s.

For the case with many wind turbines, we obtained from LES values in a range $z_{0,hi}/H$ ranging from 0.41×10^{-3} to 8.9×10^{-3}. For the sake of discussion, let us discuss a case with $z_{0,hi}=2.6$ m (case D). Then for the same value of U_G, Eq. (A6) gives $u_*=0.66$ m/s. Compared to 0.45 m/s, this represents an increase of a factor of 1.47 for the friction velocity and 2.15 for the stresses and turbulence variances. The corresponding height of the new boundary layer height is $H_G=0.16\times0.66/f=1130.6$ m. The simulation domain is still quite adequate for this. Note that the top velocity value in the simulation for the baseline case is $\bar u(z/H=1)/u_*\sim 15.0$. With $u_*=0.66$ m/s, this still means a streamwise geostrophic velocity of 10 m/s, as required by the consistency conditions.

Often, the full geostrophic wind velocity $G=\sqrt{U_G^2+V_G^2}$ is prescribed. For the V_G component, the classical derivation yields[47] $V_G/u_*=-A$, with $A\sim 12$. Frandsen *et al.*[33] quoted a value of $B=4.5$, which is similar to the Tennekes and Lumley[47] value with $A=B/\kappa=4.5/0.4=11.25$. As a result, for the no-wind-turbine case of $u_*=0.45$ m/s, we get $V_G=-5$ m/s, i.e., the bottom flow near the ground is tilted by $\tan^{-1}(5/10)=26°$ with respect to the geostrophic wind. In the simulation, we disregard the transverse mean velocity that would be needed to merge with the geostropic wind there. It is expected to have very little effect in the near-ground region. For the case with wind turbines, we get $V_G=-11.25\times0.66=-7.43$ m/s. That is to say, the near-ground flow is shifted some more, by $\tan^{-1}(7.43/10)=36.6°$ with respect to the geostrophic wind.

In terms of reduction in resource, the velocity at the wind-turbine location for case D (see Fig. 7) is about $\langle\bar u\rangle/u_*\sim 9.1$. In the case of a constant geostrophic velocity forcing described in the preceding paragraph ($U_G=10$ m/s), and a friction velocity of $u_*=0.66$ m/s, the turbine-height predicted velocity is therefore about 6 m/s. This has to be compared with the "unperturbed" case without wind turbine arrays with $U_G=10$ m/s for which the mean velocity at turbine height is $\langle\bar u\rangle/u_*=\kappa^{-1}\ln(100/0.1)\sim 17.3$. With $u_*=0.45$ m/s, this gives 7.8 m/s. Therefore, the velocity reduction factor for the baseline case is about $6/7.8\sim 0.77$. Raised to the third power, this gives a factor of 0.46. Thus, for the arrangement of the baseline case, the power extracted from the infinite array is significantly reduced compared to the case of a single turbine.

In regard to LES using x_1-direction pressure forcing as done in the present paper, the standard approach using LES with Coriolis effects and geostrophic velocity forcing is to include a term $+f(\tilde u_2 - V_G)$ in the streamwise direction momentum equation's right-hand side (instead of an applied pressure gradient), and a term $-f(\tilde u_1 - U_G)$ in the transverse direction equation. The former (streamwise direction) includes the Coriolis acceleration proportional to $-2\Omega_3\tilde u_2$ and the pressure gradient part that is in geostrophic balance: $\rho^{-1}\partial p_G/\partial x_1 = 2\Omega_3 V_G$. Thus, in our simulation we neglect $-2\Omega_3\tilde u_2$ (the Coriolis acceleration due to the transverse velocity, which has zero mean anyhow). Also, in the transverse direction, not having a pressure gradient is equivalent to neglecting the fluctuations of $\tilde u_1$ away from U_G.

Imposing a streamwise pressure gradient in the LES x_1-direction is thus equivalent to assuming a given value for the transverse geostrophic wind according to $\rho^{-1}\partial p_G/\partial x_1 = 2\Omega_3 V_G = fV_G$. Replacing f in terms of the traditional scaling between f, H_G, and u_* described above, this is therefore equivalent to imposing $\rho^{-1}\partial p_G/\partial x_1 = \exp(-\kappa C)u_*/H_G\times V_G = -A\exp(-\kappa C)u_*^2/H_G$. The standard numerical values $A=11.25$ and $C=4.5$ yield $\rho^{-1}\partial p_G/\partial x_1 = -1.8u_*^2/H_G$. This is of the same order of magnitude as the usual relationship between applied pressure forcing in the streamwise direction in a computational domain size H, i.e., $\rho^{-1}\partial p/\partial x_1 = -u_*^2/H$. The LES results from the approach of using only an applied x_1-direction pressure gradient are thus quite relevant to the case with geostrophic forcing, as long as the "turning" effects can be neglected between the ground and the region including the wind-turbine height and slightly above. There are expected to be growing levels of differences with the mean flow direction above the surface layer region of course, and also for the large-scale structures overhead that may be more susceptible to Coriolis accelerations. For the purposes of the present paper, however, the pressure gradient forcing yields useful results.

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A Summary of new evidence:

Adverse health effects and industrial wind turbines

August 2011

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To whom it may concern

In previous communications, evidence has been provided regarding the risk of adverse health effects and industrial wind turbines (IWTs). Up to now, the siting of IWTs in Ontario is based on predictive computer modelling. While there is ample evidence regarding adverse health effects, the conduct of human health studies to determine regulations for setbacks and noise levels that protect health is still lacking.

The purpose of this document is to inform authorities and decision makers of new evidence, including articles published in peer reviewed scientific journals which advance knowledge on the topic of adverse health effects of IWTs.

Based on the evidence compiled in this document, no further IWT projects should be approved in proximity to humans until human health studies are conducted to determine setbacks and noise levels that will ensure the health and welfare of all exposed individuals.

Furthermore where there are reports of adverse health and/or noise complaints IWTs should be decommissioned until the human health studies have been conducted to determine regulations for setbacks and noise levels that protect health.

This summary may be used and submitted by other individuals.

No financial compensation has been requested nor received for this summary.

Denial of adverse health effects

For years now, the Canadian Wind Energy Association (CanWEA) has denied that wind turbines can cause adverse health effects. However, based on previously known and recent information, this denial is incorrect.

A 2008 CanWEA media release informs the world "Scientists conclude that there is no evidence that wind turbines have an adverse impact on human health." [1] None of references included in this CanWEA media release state "there is no evidence that wind turbines have an adverse impact on human health."

An April 2009 CanWEA fact sheet states "Findings clearly show that there is no peer-reviewed scientific evidence indicating that wind turbines have an adverse impact on human health." [2] The fact sheet contains eight references, none of which state "there is no peer-reviewed scientific evidence indicating that wind turbines have an adverse impact on human health."

A 2009 CanWEA convened literature review concludes "Sound from wind turbines does not pose a risk of hearing loss or any other adverse health effect in humans." [3] However, the contents of the literature review contradict this conclusion by acknowledging IWT noise

may cause annoyance, stress and sleep disturbance and as a result people may experience adverse physiological and psychological symptoms. The literature review acknowledges possible symptoms include distraction, dizziness, eye strain, fatigue, feeling vibration, headache, insomnia, muscle spasm, nausea, nose bleeds, palpitations, pressure in the ears or head, skin burns, stress, and tension.

The above CanWEA sponsored statements which deny risk of adverse health effects are scientifically incorrect.

Assertions that IWTs do not pose a risk to human health only serve to confuse authorities and the public on the issue wind turbines and health effects.

For example, Ontario Minister of Health Matthews reportedly stated "There is no evidence, whatsoever, that there is an issue related to turbines." [4] This statement is scientifically incorrect.

July 2011 Environmental Review Tribunal (ERT) Decision, Ontario

As noted above, the CanWEA sponsored Colby et al. (2009) literature review stated "Sound from wind turbines does not pose a risk of hearing loss or any other adverse health effect in humans." [5] Three of the co-authors of this statement, Drs. Colby, Leventhall, and McCunney testified on behalf of the Respondents (Ministry of Environment, Suncor Energy Services Inc.) during an Ontarian Environmental Review Tribunal (ERT).

Evidence provided at the ERT demonstrated the above statement authored by the CanWEA sponsored panel experts is incorrect.

The July 2011 ERT decision for an IWT project in Ontario [6] confirmed IWTs can harm humans:

> "While the Appellants were not successful in their appeals, the Tribunal notes that their involvement and that of the Respondents, has served to advance the state of the debate about wind turbines and human health. This case has successfully shown that the debate should not be simplified to one about whether wind turbines can cause harm to humans. *The evidence presented to the Tribunal demonstrates that they can, if facilities are placed too close to residents. The debate has now evolved to one of degree."* (p. 207) (*Emphasis added*)

Evidence and testimony provided to the ERT by witnesses called by the Appellants served to advance understanding of IWT induced health impacts. It is now acknowledged that IWTs do pose a risk of adverse health effect in humans if they are improperly sited.

All ten of the witnesses called upon by the Appellants were qualified as expert witnesses. The expert witnesses called upon by the Appellants have been involved in original

research on the health effects of IWTs and/or have had related articles accepted in peer reviewed scientific journals.

During the ERT expert witnesses for both the Respondents and the Appellants provided evidence and/or testimony which acknowledged IWTs sound is perceived to be more annoying than transportation noise or industrial noise at comparable sound pressure levels.

Peer reviewed articles and other references acknowledge annoyance to be an adverse health effect. (Pedersen & Persson Waye, 2007 [7]; Michaud et al. 2005 [8]; Health Canada, 2005 [9]; Suter, 1991 [10])

During the ERT expert witnesses for both the Respondents [11], [12], [13], [14] and the Appellants provided evidence and/or testimony which acknowledge annoyance to be a health effect.

Research confirms for chronically strong annoyance a causal chain exists between the three steps health–strong annoyance–increased morbidity [15] and must be classified as a serious health risk. [16]

During the ERT expert witnesses for both the Respondents and the Appellants provided evidence and/or testimony which acknowledged IWTs "will" cause annoyance, which can result in stress related health impacts including sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory, and panic episodes associated with sensations of internal pulsation or quivering when awake or asleep, and depression.

During the ERT witnesses for both the Respondents and/or the Appellants provided evidence and/or testimony which indicate plausible causes of these health effects include: IWT amplitude modulation, audible low frequency sound, infrasound, tonality, lack of nighttime abatement, shadow flicker, visual impact, economic impacts or a combination thereof.

It is acknowledged Ontario regulations and/or noise guidelines will not protect all individuals from these health impacts. A 2010 final draft report prepared for the Ontario Ministry of Environment (MOE) states:

> "The audible sound from wind turbines, at the levels experienced at typical receptor distances in Ontario, *is nonetheless expected to result in a non-trivial percentage of persons being highly annoyed.* As with sounds from many sources, research has shown that annoyance associated with *sound from wind turbines can be expected to contribute to stress related health impacts in some persons."* [17] (*Emphasis added*)

MOE documents obtained through a Freedom of Information request confirm current Ontario IWT guidelines will cause adverse effects. One 2010 MOE internal memorandum states:

> "It appears compliance with the minimum setbacks and the noise study approach currently being used to approve the siting of WTGs will result or likely result in adverse effects contrary to subsection 14(1) of the EPA" [18]

Another MOE reference documents Ontario families that have abandoned their homes due to sleep disturbance caused by exposure to wind firms. [19] Sleep disturbance is an adverse health effect. MOE correspondence also documents families that have moved out of their homes and have made financial settlements with the respective IWT developer. [20]

Based on original research in Ontario, and elsewhere, a peer reviewed article states:

> "It is acknowledged that IWTs, if not sited properly, can adversely affect the health of exposed individuals. In addition to physiological and psychological symptoms there are individuals reporting adverse impacts, including reduced well-being, degraded living conditions, and adverse societal and economic impacts. These adverse impacts culminate in expressions of a loss of fairness and social justice.
>
> The above impacts represent a serious degradation of health in accordance with commonly accepted definitions of health as defined by the WHO and the Ottawa Charter for Health Promotion." [21]

August 2011 peer reviewed articles published in a scientific journal

Subsequent to the July Ontario ERT decision nine peer reviewed articles have been published in a special August, 2011 edition of the scientific journal, *Bulletin of Science, Technology and Society (BSTS)*. These articles explore health and social impacts of IWT installations. [22], [23], [24], [25], [26], [27], [28], [29], [30]

The Special Edition is entitled *Windfarms, Communities and Ecosystems*. Included in the special edition, is a commentary by the editor, Willem H. Vanderburg. [31]

The SAGE website states:

> *"The goal of the* ***Bulletin of Science, Technology and Society*** *is to provide a means of communication within as wide of a spectrum of the STS community as possible. This includes faculty and students from sciences, engineering, the humanities, and social science in the newly emerging groups on university and college campuses, and in the high school systems, all of which teach integrative STS subject matters. It also includes professionals in government, industry and universities, ranging from philosophers and historians of science to social scientists concerned with the effects*

> *of science and technology, scientists and engineers involved with the study and policy-making of their own craft, and the concerned general leader. A third category of readers represents "society", all journalists dealing with the impacts of science and technology in their respected fields, the public interest groups and the attentive public."* [32]

One article presents the result of WindVOiCe, an Ontario self reporting health survey that follows the principles of Health Canada for vigilance monitoring of pharmaceuticals and other products. [33]

Another article documents social justice impacts when people cannot obtain mitigation or resolution and in some cases, have abandoned their homes due to IWT exposure. [34]

An article authored by Dr. Bob Thorne documents his research on IWT noise and correlates this with reported IWT adverse health impacts. Based this field work Dr. Thorne concludes a sound level of LAeq 32 dB outside the residence is required to avoid serious harm to human health. [35]

Ontario MOE documents obtained from a Freedom of Information request support a 32 dBA sound limit for IWTs. Based on real world field investigations MOE field officers advised the Ministry about IWT adverse effects and stated "… the setback distances should be calculated using a sound level limit of 30 to 32 dBA at the receptor, instead of the 40 dBA sound level limit." [36]

Dr. Robert McMurtry, former Dean of Medicine, University of Western Ontario, and 2011 recipient of Member of Order of Canada, published a case definition to facilitate a clinical diagnosis regarding adverse health effects and IWTs. [37]

Other articles explore topics including how to properly interpret IWT epidemiological evidence, [38] the physics of IWT noise, [39] public health ethics, [40] potential IWT noise impacts on children, [41] and potential IWT infrasound sound impacts on the human ear. [42]

These articles are critical to anyone interested in the safe siting of IWTs. It is recommended that authorities and regulators obtain a copy of each of the nine articles.

Please use this link if you wish to access these articles http://bst.sagepub.com

Downloads of these articles can be obtained with an individual subscription for $100. This will allow you to download these and other articles from the BSTS scientific journal.

IWT low frequency noise and infrasound

In the past some commentators have stated low frequency noise from IWTs is not an issue. Other references indicate most available evidence suggests that reported IWT health effects, such as sleeplessness and headache, are related to audible low frequency noise. [43]

A June 2011 Federal Australian Senate committee investigating IWT and adverse health effects report recommended:

> "… noise standards adopted by the states and territories for the planning and operation of rural wind farms should include appropriate measures to calculate the impact of low frequency noise and vibrations indoors at impacted dwellings." [44]

A June 2011 peer reviewed article on IWT low frequency noise is available. [45]

The abstract states:

> As wind turbines get larger, worries have emerged that the turbine noise would move down in frequency and that the low-frequency noise would cause annoyance for the neighbors. The noise emission from 48 wind turbines with nominal electric power up to 3.6 MW is analyzed and discussed. The relative amount of low-frequency noise is higher for large turbines (2.3–3.6 MW) than for small turbines ([1] 2 MW), and the difference is statistically significant. The difference can also be expressed as a downward shift of the spectrum of approximately one-third of an octave. A further shift of similar size is suggested for future turbines in the 10-MW range. Due to the air absorption, the higher low-frequency content becomes even more pronounced, when sound pressure levels in relevant neighbor distances are considered. Even when A-weighted levels are considered, a substantial part of the noise is at low frequencies, and for several of the investigated large turbines, the one-third-octave band with the highest level is at or below 250 Hz. It is thus beyond any doubt that the low-frequency part of the spectrum plays an important role in the noise at the neighbors."

Annoyance from audible low frequency noise is acknowledged to be more severe in general. Low frequency noise does not need to be considered loud for it to cause annoyance and irritation. [46] Low frequency noise causes immense suffering to those who are unfortunate to be sensitive to it [47] and chronic psychophysiological damage may result from long-term exposure to low-level low frequency noise. [48] Some symptoms associated with exposure to low frequency noise include annoyance, stress, sleep disturbance, headaches, difficulty concentrating, irritability, fatigue, dizziness or vertigo, tinnitus, anxiety, heart ailments and palpitation. [49], [50], [51]

Møller and Pedersen, (2011) indicate IWT low frequency noise is more of an issue for large turbines of 2.3 MW and up. [52] However low frequency noise from smaller turbines (ie 1.5MW) can also cause adverse health effects. Freedom of Information documents

obtained from the MOE document low frequency noise issues from smaller IWTs (i.e., 1.5 MW) at Ontario wind farms. The MOE documents how IWT low frequency noise caused a home to be "uninhabitable" resulting in family members abandoning trying to sleep there. [53] For further discussion see Krogh (2011) [54] and Thorne (2011). [55]

Research on the potential impacts of IWT infrasound has been published in two peer reviewed scientific journals (Salt and Hullar, 2010 [56], Salt and Kaltenbach, 2011 [57]). These articles conclude that it is scientifically possible that infrasound from IWTs could affect people living nearby and more research is needed.

Wind Turbines Noise, Fourth International Meeting

During the Rome Conference Fourth International Meeting on Wind Turbine Noise Rome Italy 12-14 April 2011 there were a number of presentations documenting IWT noise issues.

The Wind Turbine Noise (2011) post-conference report states:

> "The main effect of daytime wind turbine noise is annoyance. The night time effect is sleep disturbance. These may lead to stress related illness in some people. Work is required in understanding why low levels of wind turbine noise may produce affects which are greater than might be expected from their levels." [58]

A number of conference papers addressed human health impacts of IWTs. For example one research team conducted a study which demonstrated those living in the immediate vicinity of IWTs scored worse than a matched control group in terms of physical and environmental health related quality of life (HRQOL). [59]

The Ontario ERT expert witnesses for both the Respondents and the Appellants provided evidence and/or testimony which acknowledged IWT amplitude modulation and/or audible low frequency noise are probable causes of IWT adverse health effects.

Research related to low frequency noise "…confirms the importance of fluctuations as a contributor to annoyance and the limitation of those assessment methods, which do not include fluctuations in the assessment." [60]

In addition, the World Health Organization states:

> "Noise measures based solely on LAeq values do not adequately characterize most noise environments and do not adequately assess the health impacts of noise on human well-being. It is also important to measure the maximum noise level and the number of noise events when deriving guideline values. If the noise includes a large proportion of low-frequency components, values even lower than the guideline values will be needed, because low-frequency components in noise may increase the adverse

effects considerably. When prominent low-frequency components are present, measures based on A-weighting are inappropriate."[61]

Consultants for the Ontario MOE, Aercoustics, submitted a paper at the Fourth International Meeting on Wind Turbine Noise which states:

> "Sound emissions from operating wind farms frequently give rise to noise complaints. Most compliance-based noise audits measure hourly "A"-weighted Leq, thereby removing the low-frequency contents of the wind turbine sound. The metric is also insensitive to amplitude modulation and is unsatisfactory when sensitive receptor are annoyed by the low frequency sound and amplitude modulation."[62]

Current Ontario guidelines are based on the A-Weighted Leq metric and hence must be considered unsatisfactory to protect individuals from the health impacts of IWT amplitude modulation and/or low frequency noise.

The need for research

The authors of a Canadian Wind Energy Association sponsored report state they do not "advocate for funding further studies."[63]

The April 2011 Wind Turbine Noise post-conference report states:

> "Work is required in understanding why low levels of wind turbine noise may produce affects which are greater than might be expected from their levels."[64]

A June 2011 Australian Senate committee investigating IWT and adverse health effects report recommended:

> "… the Commonwealth Government initiate as a matter of priority thorough, adequately resourced epidemiological and laboratory studies of the possible effects of wind farms on human health. This research must engage across industry and community, and include an advisory process representing the range of interests and concerns."[65]

The July 2011 Ontario ERT decision also acknowledged that more research is needed.[66]

> "Just because the Appellants have not succeeded in their appeals, that is no excuse to close the book on further research. On the contrary, further research should help resolve some of the significant questions that the Appellants have raised." (p. 207)

– International experts who have conducted original research and/or published peer reviewed articles in scientific journals confirm that research is required.[67], [68], [69], [70], [71], [72], [73], [74], [75], [76]

Inappropriate use of literature reviews

Literature reviews can be useful tools for summarizing existing literature related to a particular topic. In order to be considered reliable a literature review must be complete, accurate, and objective.

In recent years a number of literature reviews have been produced which purport to explore the health effect of IWTs. Some literature reviews which have been relied upon to deny IWTs can adversely affect the health of humans. These literature reviews include Chatham-Kent Public Health Unit. (2008),[77] Colby et al, (2009),[78] Ontario Chief Medical Officer of Health, (2010),[79] and the National Health and Medical Research Council (Australia) (2010).[80] None of these literature reviews have been published in a peer reviewed scientific journal.

Reliance on these literature reviews is inappropriate as they contain errors of omission and/or commission and are neither convincing nor authoritative. Many of the conclusions are incomplete, inaccurate, lack objectivity and consequently only serve to confuse the issue of IWT health effects.

For example, these literature reviews limit their discussion to direct effects using qualifiers such as "direct physiopathological effects" or "direct causal links". Failure to carefully evaluate the indirect causal pathways and the psychological harm of IWT exposure represent errors of omission. Annoyance, sleep disturbance, cognitive and emotional response, and stress are health effects that occur through the indirect pathway.[81] The health outcomes associated with the indirect pathway are significant.

> "Physiological experiments on humans have shown that noise of a moderate level acts via an indirect pathway and has health outcomes similar to those caused by high noise exposures on the direct pathway. The indirect pathway starts with noise-induced disturbances of activities such as communication or sleep."[82]

The Ontario Environmental Review Tribunal expressed concern that the Director for the MOE relied on references which did not address the indirect pathway.[83]

As a consequence of their weaknesses some literature reviews have been criticized for their poor quality.

In March 2011, the Chief Executive Officer of National Health and Medical Research Council stated regarding their July 2010 literature review:

> "We regard this as a work in progress. We certainly do not believe that this question has been settled. That is why we are keeping it under constant review. That is why we said in our review that we believe authorities must take a precautionary approach to this."[84]

Chatham-Kent Public Health Unit (2008),[85] Colby et al, December 2009,[86] Ontario Chief Medical Officer of Health (2010),[87] share many of the same weaknesses as National Health and Medical Research Council (2010).[88] These literature reviews cannot be relied for Renewable Energy Applications and/or Renewable Energy Approvals to support the contention there is no evidence that IWTs can cause adverse health effects. For detailed analysis of some of these literature reviews visit www.windvigilance.com

Conclusion

Based on the best available evidence the following conclusions can be made

1. The Canadian Wind Energy Association sponsored statements that IWTs do not pose a risk of adverse health effects in humans are scientifically incorrect.
2. Experts who have conducted original research and/or published peer reviewed articles in scientific journals confirm IWTs can harm human health if they not sited properly.
3. Acknowledged adverse health effects include: annoyance, stress, sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory, and panic episodes associated with sensations of internal pulsation or quivering when awake or asleep. Other adverse impacts include reduced well-being, degraded living conditions, and adverse societal and economic impacts. These adverse impacts culminate in expressions of a loss of fairness and social justice.
4. The above impacts in conclusion 3 represent a serious degradation of health in accordance with commonly accepted definitions of health as defined by the WHO and the Ottawa Charter for Health Promotion.
5. It is expected that at typical setbacks and with the noise study approach currently being used in Ontario to approve the siting of IWTs, a non trivial percentage of exposed individuals will experience serious degradation of health.

6. Harm to human health can be avoided with science based regulations based on research conducted on human response to IWT exposure.
7. Experts who have conducted original research and/or published peer reviewed articles in scientific journals confirm that research is required to establish scientifically based IWT regulations to protect human health.
8. Until scientifically based research has been conducted IWTs should not sited in proximity to human habitation.

Respectfully submitted,

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WindVOiCe, a Self-Reporting Survey: Adverse Health Effects, Industrial Wind Turbines, and the Need for Vigilance Monitoring

Carmen M.E. Krogh[1], Lorrie Gillis[2], Nicholas Kouwen[3], and Jeff Aramini[4]

Abstract

Industrial wind turbines have been operating in many parts of the globe. Anecdotal reports of perceived adverse health effects relating to industrial wind turbines have been published in the media and on the Internet. Based on these reports, indications were that some residents perceived they were experiencing adverse health effects. The purpose of the WindVOiCe health survey was to provide vigilance monitoring for those wishing to report their perceived adverse health effects. This article discusses the results of a self reporting health survey regarding perceived adverse health effects associated with industrial wind turbines.

Keywords

Self-reporting, adverse health effects, industrial wind turbines, health survey, vigilance monitoring

Introduction

Many Ontarians living close to industrial wind turbines (IWTs) who believe they are suffering adverse health effects are hesitant to report their symptoms. Individuals report that this hesitancy is because of the manner in which their claims have often been discounted or ignored by the wind energy industry and government officials (Hansard, 2009, pp. G-516, G-547). As a result of a limited number who first came forward to report their symptoms, WindVOiCe was established in March 2009.

WindVOiCe is a self-reporting health survey that collects data about adverse health effects being reported by families living near IWTs. The WindVOiCe health survey follows the principles of Health Canada's *Canada Vigilance Programs*, which encourages all consumers in Canada to self-report perceived adverse health effects from prescription and consumer products, vaccines and other. Medical and health care practitioners are encouraged to report perceived adverse health effects to the *Canada Vigilance*. Consumers do not have to prove the effect, only perceive it. The pharmaceutical industry is obligated by law to submit any reported adverse health effects it receives to Health Canada (Health Canada, n.d.).

The objectives of WindVOiCe are to:

document any changes in health outcomes among individuals living near IWTs

if documented, provide information to assess the need for large-scale controlled epidemiological studies and to establish evidence-based and safe residence setback distances.

Methods

Study Design and Participant Recruitment

This is a self-reporting survey based on perceived adverse health effects occurring with the onset of an industrial wind turbine facility.

The WindVOiCe survey questionnaire reproduced that of Harry (2007). The questionnaire is designed to collect basic demographic information and information on any new adverse health outcomes and changes to quality of life since the start of the respective IWT project (Appendix A). Health outcome observations included headaches and migraines, heart palpitations, excessive tiredness and sleep disturbance, stress and anxiety, depression, tinnitus, and hearing problems.

A Health Survey Contact Flyer was distributed starting in March 2009 to residents in five project areas where adverse health effects had been anecdotally reported (Appendix B): Melancthon Phase 1 and 2 (Shelburne), Canadian Hydro Wind Developers (Shelburne), Kingsbridge 1 Wind Power (Goderich), Kruger Energy Port Alma (Port Alma), Ripley Wind Power (Ripley), Enbridge Ontario Wind Farm (Kincardine), and Erie Shores Wind Farm (Port Burwell).

The Health Survey Contact Flyer was distributed by Canada Post and in some cases by volunteers who hand-delivered it to mailboxes in the areas where IWTs were situated. The opportunity to participate in the WindVOiCe project also involved distributing notices at community information sessions, by word of mouth, and via the Internet (The Society for Wind Vigilance, n.d.).

A confidential toll free telephone number and e-mail address were provided. Those who contacted the WindVOiCe survey team were assured of total confidentiality and anonymity. There were no restrictions placed on the distribution or access to the survey in communities with IWTs. Individuals experiencing adverse health effects and those who were not were encouraged to fill out and submit a health survey. Both hard copy and rarely, electronic copies, were sent on request. Each interested adult in the home was asked to complete a separate survey, with a minimum age of 18 years and fluency in English specified as requirements. The WindVOiCe health survey could not be used by anyone with any cognitive impairment.

Those interested in participating in the study were provided with the survey, a cover page giving general instructions (Appendix C) and a cover note with mailing instructions (Appendix D). Surveys were typically mailed to those wishing to participate and were returned by Canada Post.

Questionnaire Processing

The WindVOiCe Scrutinizer validated each returned survey. The survey contact lead and scrutinizer transferred results into an electronic database (Microsoft Office Excel 2003). Respondents were given the opportunity to include additional comments and these were transcribed exactly as stated. A strict protocol was employed to protect confidentiality and data integrity of the returned surveys.

Data Analysis

All analyses were performed using SAS 9.22 (2008, SAS Institute Inc., Cary, NC).

Descriptive analyses were performed to investigate and describe participant demographics and frequency of health outcome responses. The association between health outcomes and distance to nearest IWT was also investigated. Distance to the nearest IWT was assessed both as a categorical and continuous variable. Significance of associations when distance to nearest IWT was assessed as a categorical variable involved using Proc FREQ (Fisher's exact test). Significance of associations when distance to nearest IWT was assessed as a continuous variable involved using Proc GENMOD (logit link, binomial distribution). Age and gender were included in the Proc GENMOD model if significant at $p < .05$.

For the purpose of interpreting statistical significance, the following parameters were used:

$p < .05$ = significant
p .1 to .05 = moderately significant
$p > .1$ = not significant

Results

Data Preparation for Analysis

- Number of Ontario WindVOiCe survey participants = 109
- Responses of "maybe," "unsure," or "left blank," were all set to "No"
- Those reporting either Altered Health or Altered Quality of Life included = 102
- Four (4) participants were younger than 18 years and were removed.
- Two (2) participants were much further away from IWTs compared with the rest (5 kilometers) and were removed from further analysis given the distance gap.
- Distance to nearest IWT was divided into four groups based on natural break-points among the participants: 350 to 499 meters, 500 to 699 meters, 700 to 899 meters, and 900 to 2400 meters.

Participant Comments

Survey participants were given the opportunity to volunteer comments. A representative selection of comments is provided in Appendix E.

Discussion

A case report is a descriptive study of a single individual (case report) or small group (case series) in which the possibility of an association between an observed effect and a specific environmental exposure is based on clinical evaluations and histories of the individual(s). Because cases in a case series study are often self-identifying and population controls are lacking (as in this study), it is difficult to investigate and measure exposure–outcome relationships, and it is impossible to extrapolate results to the general population as selection bias is always a concern. That said, case reports (or case series) often provide the first indicators in identifying a new disease or adverse health effect from an exposure.

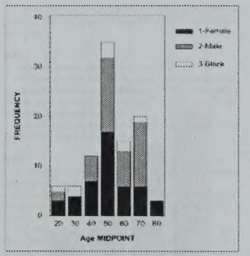

Figure 1. Age (years) and gender of participants
Age: mean = 52 years, range = 19-83 years. Gender: female = 52%, male = 48%.

Study participants ranged in age from 19 to 83 years, there was approximately an equal number of males and females enrolled in the study (Figure 1); and the frequency of participants increased with closer distances to IWTs (Figure 2).

In total, 72% of participants reported increased symptoms of anxiety, stress, or depression since the start of their local wind project (Table 1), and not unexpectedly, mental distress was *not* associated with distance to nearest IWT. Distress likely played a major role in individuals self-identifying themselves for the study, and it is reasonable to assume that individuals experiencing distress because of IWTs for whatever reason (real or perceived adverse health effect, attitude, etc.) were more likely to participate in the study. Among study participants, the most common adverse health outcomes reported included sleep disturbance, excessive tiredness, and headaches.

Although it is not possible to compare participants to a control group in this study, it is possible to investigate relationships between exposure levels (as measured by distance to IWT) and outcomes *among* participants. Results suggest dose–response relationships between a number of adverse health outcomes and distance to IWTs, particularly sleep disturbance, excessive tiredness, and headaches (Figures 3-6). Modeling efforts suggested stronger relationships between adverse health events and log-distance to IWTs compared with linear distance. This mirrors the way in which sounds decays as it travels from source to receptor.

Discovering relationships between adverse health outcomes and log-distance (Figures 7-9) to IWTs among self-reported cases is a significant finding and supports the underlying hypothesis that living too close to IWTs can cause adverse health effects. If adverse effects were purely psychosomatic (i.e., the result of emotional distress and fear), one would expect the proportion of individuals self-reporting to increase closer to IWTs in this alternative hypothesis; but among those who did self-report, one would *not* expect dose–response relationships. Lack of a true cause–effect relationship should have resulted in relationships with distance to IWTs as seen with stress, anxiety, and depression (i.e., the primary drivers of self-reporting in this alternative hypothesis).

It is noted that the comments excerpted from the survey range from descriptions of altered quality of life and enjoyment of property, health issues related to noise, flicker and sleep disturbance, altered social and family interactions, concerns about property values and altered financial status, changes in pet and wildlife behavior, and concerns about the future. Some describe the impact on the family unit when a parent or spouse has been billeted at the developers' expense because of adverse health effects. These comments were voluntarily submitted by participants.

Conclusion

Self-reporting is an important research tool and frequently used by the research community. Examples of the use of self-reporting include peer-reviewed articles by Engstrom, Paterson, Doherty, Trabulsi, and Speer (2003), Meyer, McPartlan, Sines, and Waller (2009), Zota, Aschengrau, Rudel, and Brody (2010), and Lim et al. (2010). In addition, self-reporting is encouraged with respect to breast cancer vigilance where women are encouraged to conduct routine breast examinations. This self monitoring is used as an adjunct to other monitoring procedures such as mammograms and checkups by physicians.

It is important not to overinterpret results of a self-reporting case-series study. Outcome measures are crude, and the lack of a control group and potential selection bias prevents investigating traditional population-based epidemiological measures of association (e.g., odds ratios, relative risk, etc.). Careful analysis of case-series data, however, can provide important initial indicators regarding underlying causal relationships, providing support for more thorough and larger scale epidemiology studies. Results of this study suggest an underlying relationship between IWTs and adverse health effects and support the need for additional studies.

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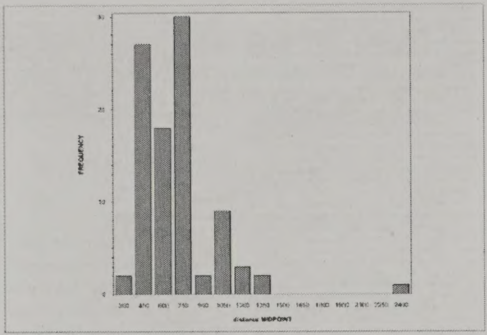


Figure 2. Distance of participants to nearest industrial wind turbine (meters)
Distance: mean = 707 meters, range = 350-2400 meters.

Table 1. Health Outcomes Results

		Distance Range From Residence to Nearest IWT in Meters (Mean)						
Parameter	All Participants	350-490 (428)	500-673 (587)	350-673 (506)	700-808 (789)	900-2400 (1154)	700-2400 (908)	p[a]
Number of responses	97	24	23	47	30	17	47	
Altered quality of life (%)	97	96	96	96	100	94	98	1.0000
Altered health (%)	90	93	96	94	87	82	85	.1908
Disturbed sleep (%)	69	78	78	78	60	59	60	**.0778**
Excessive tiredness (%)	76	89	83	86	63	71	66	**.0107**
Headaches (%)	62	74	65	70	60	41	53	**.0990**
Migraines (%)	13	22	13	18	13	0	9	.2358
Hearing problems (%)	35	22	57	38	27	41	32	.6706
Tinnitus (%)	56	59	61	60	33	41	51	.4179
Heart palpitations (%)	34	26	39	32	33	37	34	.6750
Stress (%)	69	74	57	66	70	76	72	.5187
Anxiety (%)	52	52	57	54	40	65	49	.6864
Depression (%)	41	44	48	46	33	41	36	.4099
Distress[b] (%)	72	74	61	68	73	82	77	.3735
Approached doctor (%)	38	37	39	38	40	35	38	1.0000

Note: Significant or moderately significant p values are in the boldfaced.
[a] Fisher's exact test.
[b] Distress = "Yes" if at least one of stress, anxiety, or depression reported as "Yes."

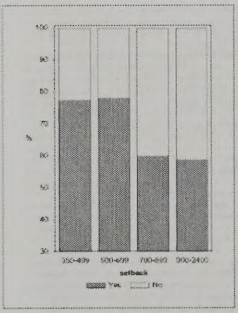


Figure 3. Sleep disturbance by distance (meters)

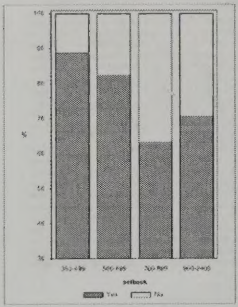


Figure 4. Excessive tiredness by distance (meters)

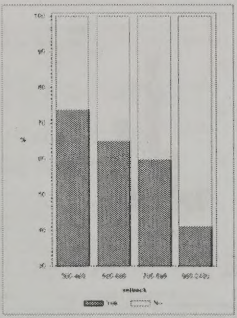


Figure 5. Headaches by distance (meters)

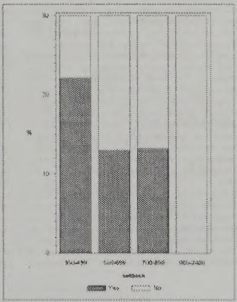


Figure 6. Migraines by distance (meters)

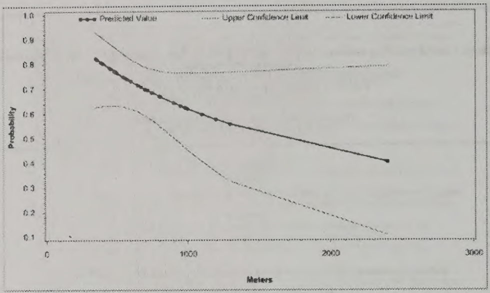


Figure 7. Predicted probability of sleep disturbance by distance to industrial wind turbine (95% upper and lower confidence limits)
Proc Genmod (logit link; binomial distribution). Sleep = ln(distance) + sex + intercept. p(ln distance) = .1015

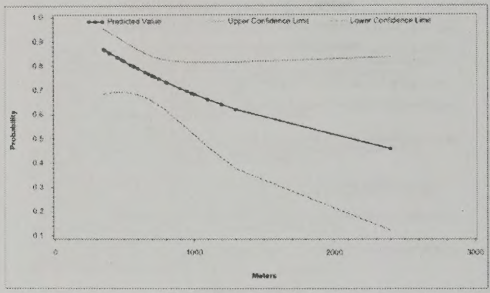


Figure 8. Predicted probability of excessive tiredness by distance to industrial wind turbine (95% upper and lower confidence limits)
Proc Genmod (logit link; binomial distribution). Excessive tiredness = ln(distance) + sex + intercept. p(ln distance) = .1065.

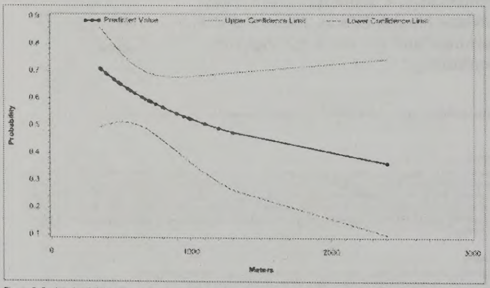


Figure 9. Predicted probability of headaches by distance to industrial wind turbine (95% upper and lower confidence limits)
Proc Genmod (logit link; binomial distribution). Headaches = ln(distance) + sex + intercept. p(ln distance) = .1637.

Appendix A
WindVOiCe Survey Questionnaire

Adult survey questionnaire
WindVoice (Wind Vigilance for Ontario Communities)

1) Name (preferred but optional)

2) Date of birth

Day ________ Month ________ Year ________

3) Occupation
4) Address and/or postal code

5) Which wind farm is near your property?

6) How far away from your property is the nearest turbine?

7) How long have you been living at this property?

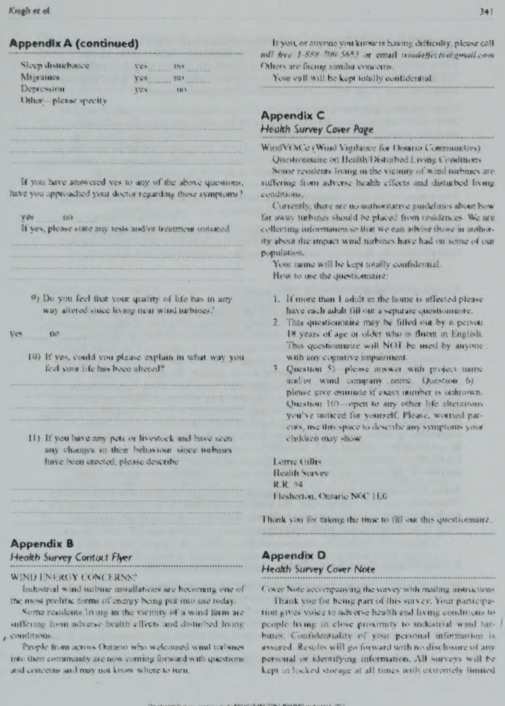
8) Do you feel that your health has in any way been affected since the erection of these turbines?

If yes, please answer the following
Do you feel that since living near a wind turbine/turbines you have experienced excess of the following symptoms (i.e., more than you did prior to living near these structures)?

Headaches	yes	no
Palpitations	yes	no
Excessive tiredness	yes	no
Stress	yes	no
Anxiety	yes	no
Tinnitus (ringing in ears)	yes	no
Hearing problems	yes	no

(Continued)

Comment Letter P170



Appendix A (continued)

Sleep disturbance yes........ no........
Migraines yes........ no........
Depression yes........ no
Other—please specify

If you have answered yes to any of the above questions, have you approached your doctor regarding these symptoms?

yes _____ no _____
If yes, please state any tests and/or treatment initiated

9) Do you feel that your quality of life has in any way altered since living near wind turbines?

yes _____ no _____

10) If yes, could you please explain in what way you feel your life has been altered?

11) If you have any pets or livestock and have seen any changes in their behaviour since turbines have been erected, please describe

Appendix B
Health Survey Contact Flyer

WIND ENERGY CONCERNS?

Industrial wind turbine installations are becoming one of the most prolific forms of energy being put into use today.

Some residents living in the vicinity of a wind farm are suffering from adverse health effects and disturbed living conditions.

People from across Ontario who welcomed wind turbines into their community are now coming forward with questions and concerns and may not know where to turn.

If you, or anyone you know is having difficulty, please call *toll free 1-888-700-5653* or email *windaffected@gmail.com* Others are facing similar concerns.

Your call will be kept totally confidential.

Appendix C
Health Survey Cover Page

WindVOiCe (Wind Vigilance for Ontario Communities)

Questionnaire on Health/Disturbed Living Conditions

Some residents living in the vicinity of wind turbines are suffering from adverse health effects and disturbed living conditions.

Currently, there are no authoritative guidelines about how far away turbines should be placed from residences. We are collecting information so that we can advise those in authority about the impact wind turbines have had on some of our population.

Your name will be kept totally confidential.

How to use the questionnaire:

1. If more than 1 adult in the home is affected please have each adult fill out a separate questionnaire.
2. This questionnaire may be filled out by a person 18 years of age or older who is fluent in English. This questionnaire will NOT be used by anyone with any cognitive impairment.
3. Question 5)—please answer with project name and/or wind company name. Question 6)—please give estimate if exact number is unknown. Question 10)—open to any other life alterations you've noticed for yourself. Please, worried parents, use this space to describe any symptoms your children may show.

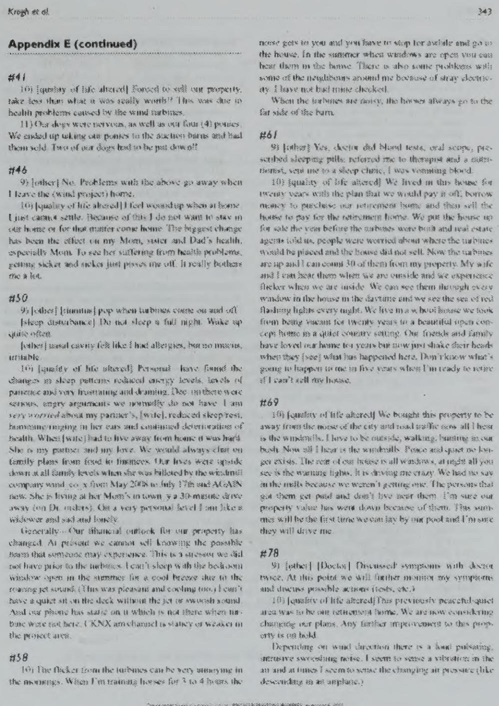
Lorrie Gillis
Health Survey
R.R. #4
Flesherton, Ontario N0C 1E0

Thank you for taking the time to fill out this questionnaire.

Appendix D
Health Survey Cover Note

Cover Note accompanying the survey with mailing instructions

Thank you for being part of this survey. Your participation gives voice to adverse health and living conditions to people living in close proximity to industrial wind turbines. Confidentiality of your personal information is assured. Results will go forward with no disclosure of any personal or identifying information. All surveys will be kept in locked storage at all times with extremely limited



Appendix E (continued)

#41
10) [quality of life altered] Forced to sell our property, take less than what it was really worth!! This was due to health problems caused by the wind turbines.

11) Our dogs were nervous, as well as our four (4) ponies. We ended up taking our ponies to the auction barns and had them sold. Two of our dogs had to be put down!!

#46
9) [other] No. Problems with the above go away when I leave the (wind project) home.

10) [quality of life altered] I feel wound up when at home. I just cannot settle. Because of this I do not want to stay in our home or for that matter come home. The biggest change has been the effect on my Mom, sister and Dad's health, especially Mom. To see her suffering from health problems, getting sicker and sicker just pisses me off. It really bothers me a lot.

#50
9) [other] [tinnitus] pop when turbines come on and off

[sleep disturbance] Do not sleep a full night. Wake up quite often.

[other] nasal cavity felt like I had allergies, but no mucus, irritable.

10) [quality of life altered] Personal—have found the changes in sleep patterns reduced energy levels, levels of patience and very frustrating and draining. Dec. on there were serious, angry arguments we normally do not have. I am *very worried* about my partner's, [wife], reduced sleep/rest, humming/ringing in her ears and continued deterioration of health. When [wife] had to live away from home it was hard. She is my partner and my love. We would always chat on family plans from food to finances. Our lives were upside down at all family levels when she was billeted by the windmill company wind_co_x from May 2008 to July 17th and AGAIN now. She is living at her Mom's in town_y a 30-minute drive away (on Dr. orders). On a very personal level I am like a widower and sad and lonely.

Generally—Our financial outlook for our property has changed. At present we cannot sell knowing the possible harm that someone may experience. This is a stressor we did not have prior to the turbines. I can't sleep with the bedroom window open in the summer for a cool breeze due to the roaring jet sound. (This was pleasant and cooling too.) I can't have a quiet sit on the deck without the jet or swoosh sound. And our phone has static on it which is not there when turbine were not here. CKNX am channel is staticy or weaker in the project area.

#58
10) The flicker from the turbines can be very annoying in the mornings. When I'm training horses for 3 to 4 hours the noise gets to you and you have to stop for awhile and go to the house. In the summer when windows are open you can hear them in the house. There is also some problems with some of the neighbours around me because of stray electricity. I have not had mine checked.

When the turbines are noisy, the horses always go to the far side of the barn.

#61
9) [other] Yes, doctor did blood tests, oral scope, prescribed sleeping pills; referred me to therapist and a nutritionist, sent me to a sleep clinic, I was vomiting blood.

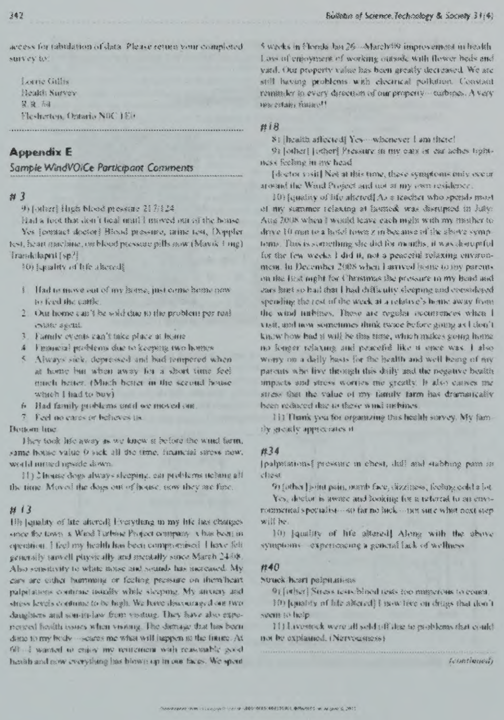
10) [quality of life altered] We lived in this house for twenty years with the plan that we would pay it off, borrow money to purchase our retirement home and then sell the house to pay for the retirement home. We put the house up for sale the year before the turbines were built and real estate agents told us, people were worried about where the turbines would be placed and the house did not sell. Now the turbines are up and I can count 30 of them from my property. My wife and I can hear them when we are outside and we experience flicker when we are inside. We can see them through every window in the house in the daytime and we see the sea of red flashing lights every night. We live in a school house we took from being vacant for twenty years to a beautiful open concept home in a quiet country setting. Our friends and family have loved our home for years but now just shake their heads when they [see] what has happened here. Don't know what's going to happen to me in five years when I'm ready to retire if I can't sell my house.

#69
10) [quality of life altered] We bought this property to be away from the noise of the city and road traffic now all I hear is the windmills. I love to be outside, walking, hunting in our bush. Now all I hear is the windmills. Peace and quiet no longer exists. The rear of our house is all windows, at night all you see is the warning lights. It is driving me crazy. We had no say in the mills because we weren't getting one. The persons that got them get paid and don't live near them. I'm sure our property value has went down because of them. This summer will be the first time we can lay by our pool and I'm sure they will drive me.

#78
9) [other] [Doctor] Discussed symptoms with doctor twice. At this point we will further monitor my symptoms and discuss possible actions (tests, etc.)

10) [quality of life altered] This previously peaceful-quiet area was to be our retirement home. We are now considering changing our plans. Any further improvement to this property is on hold.

Depending on wind direction there is a loud pulsating, intrusive swooshing noise. I seem to sense a vibration in the air and at times I seem to sense the changing air pressure (like descending in an airplane.)



access for tabulation of data. Please return your completed survey to:

Lorrie Gillis
Health Survey
R.R. #4
Flesherton, Ontario N0C 1E0

Appendix E
Sample WindVOiCe Participant Comments

3
9) [other] High blood pressure 217/124

Had a foot that don't heal until I moved out of the house

Yes [contact doctor] Blood pressure, urine test, Doppler test, heart machine, on blood pressure pills now (Mavik 1 mg) Trandolapril [sp?]

10) [quality of life altered]

1. Had to move out of my home, just come home now to feed the cattle.
2. Our home can't be sold due to the problem per real estate agent.
3. Family events can't take place at home
4. Financial problems due to keeping two homes
5. Always sick, depressed and bad tempered when at home but when away for a short time feel much better. (Much better in the second house which I had to buy)
6. Had family problems until we moved out.
7. Feel no cares or believes us.

Bottom line

They took life away as we knew it before the wind farm, same house value 0 sick all the time, financial stress now, world turned upside down.

11) 2 house dogs always sleeping, cat problems itching all the time. Moved the dogs out of house, now they are fine.

13
10) [quality of life altered] Everything in my life has changes since the town x Wind Turbine Project company x has been in operation. I feel my health has been compromised. I have felt generally unwell physically and mentally since March 24/08. Also sensitivity to white noise and sounds has increased. My ears are either humming or feeling pressure on them/heart palpitations continue usually while sleeping. My anxiety and stress levels continue to be high. We have discouraged our two daughters and son-in-law from visiting. They have also experienced health issues when visiting. The damage that has been done to my body—scares me what will happen in the future. At 60—I wanted to enjoy my retirement with reasonable good health and now everything has blown up in our faces. We spent 5 weeks in Florida Jan 26—March/09 improvement in health. Loss of enjoyment of working outside with flower beds and yard. Our property value has been greatly decreased. We are still having problems with electrical pollution. Constant reminder in every direction of our property—turbines. A very uncertain future!!

#18
8) [health affected] Yes—whenever I am there!

9) [other] [other] Pressure in my ears or ear aches tightness feeling in my head

[doctor visit] Not at this time, these symptoms only occur around the Wind Project and not at my own residence.

10) [quality of life altered] As a teacher who spends most of my summer relaxing at [home] was disrupted in July/Aug 2008 when I would leave each night with my mother to drive 10 min to a hotel town z in because of the above symptoms. This is something she did for months, it was disrupted for the few weeks I did it, not a peaceful relaxing environment. In December 2008 when I arrived home to my parents on the first night for Christmas the pressure in my head and ears hurt so bad that I had difficulty sleeping and considered spending the rest of the week at a relative's home away from the wind turbines. These are regular occurrences when I visit, and now sometimes think twice before going as I don't know how bad it will be this time, which makes going home no longer relaxing and peaceful like it once was. I also worry on a daily basis for the health and well being of my parents who live through this daily and the negative health impacts and stress worries me greatly. It also causes me stress that the value of my family farm has dramatically been reduced due to these wind turbines.

11) Thank you for organizing this health survey. My family greatly appreciates it.

#34
[palpitations] pressure in chest, dull and stabbing pain in chest

9) [other] joint pain, numb face, dizziness, feeling cold a lot

Yes, doctor is aware and looking for a referral to an environmental specialist—so far no luck—not sure what next step will be.

10) [quality of life altered] Along with the above symptoms—experiencing a general lack of wellness

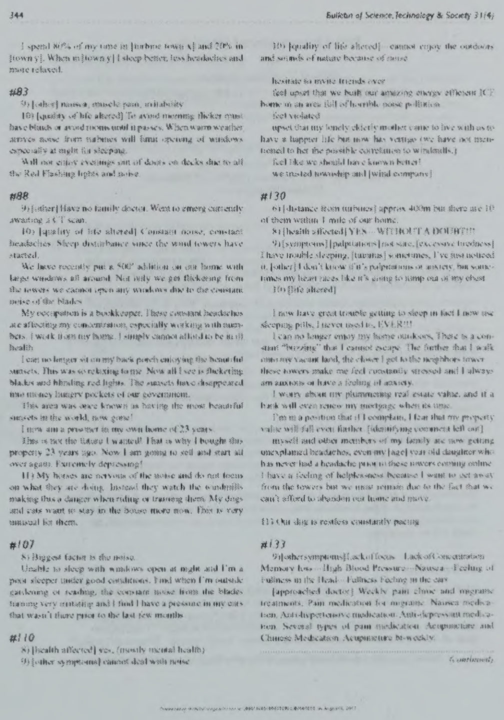
#40
Struck heart palpitations

9) [other] Stress tests/blood tests too numerous to count.

10) [quality of life altered] I now live on drugs that don't seem to help

11) Livestock were all sold off due to problems that could not be explained. (Nervousness)

(continued)



I spend 80% of my time in [turbine town x] and 20% in [town y]. When in [town y] I sleep better, less headaches and more relaxed.

#83
9) [other] nausea, muscle pain, irritability

10) [quality of life altered] To avoid morning flicker must have blinds or avoid rooms until it passes. When warm weather arrives noise from turbines will limit opening of windows especially at night for sleeping.

Will not enjoy evenings out of doors on decks due to all the Red Flashing lights and noise.

#88
9) [other] Have no family doctor. Went to emerg currently awaiting a CT scan.

10) [quality of life altered] Constant noise, constant headaches. Sleep disturbance since the wind towers have started.

We have recently put a 500' addition on our home with large windows all around. Not only we get flickering from the towers we cannot open any windows due to the constant noise of the blades.

My occupation is a bookkeeper. These constant headaches are affecting my concentration, especially working with numbers. I work from my home. I simply cannot afford to be in ill health.

I can no longer sit on my back porch enjoying the beautiful sunsets. This was so relaxing to me. Now all I see is flickering blades and blinding red lights. The sunsets have disappeared into money hungry pockets of our government.

This area was once known as having the most beautiful sunsets in the world, now gone!

I now am a prisoner in my own home of 23 years.

This is not the future I wanted! That is why I bought this property 23 years ago. Now I am going to sell and start all over again. Extremely depressing!

11) My horses are nervous of the noise and do not focus on what they are doing. Instead they watch the windmills making this a danger when riding or training them. My dogs and cats want to stay in the house more now. This is very unusual for them.

#107
8) Biggest factor is the noise.

Unable to sleep with windows open at night and I'm a poor sleeper under good conditions. I find when I'm outside gardening or reading, the constant noise from the blades turning very irritating and I find I have a pressure in my ears that wasn't there prior to the last few months.

#110
8) [health affected] yes, (mostly mental health)

9) [other symptoms] cannot deal with noise

10) [quality of life altered]—cannot enjoy the outdoors and sounds of nature because of noise

hesitate to invite friends over

feel upset that we built our amazing energy efficient ICF home in an area full of horrible noise pollution

feel violated

upset that my lonely elderly mother came to live with us to have a happier life but now has vertigo (we have not mentioned to her the possible correlation to windmills.)

feel like we should have known better!

we trusted township and [wind company]

#130
6) [distance from turbines] approx 400m but there are 10 of them within 1 mile of our home.

8) [health affected] YES—WITHOUT A DOUBT!!!

9) [symptoms] [palpitations] not sure, [excessive tiredness] I have trouble sleeping, [tinnitus] sometimes, I've just noticed it, [other] I don't know if it's palpitations or anxiety, but sometimes my heart races like it's going to jump out of my chest

10) [life altered]

I now have great trouble getting to sleep in fact I now use sleeping pills, I never used to, EVER!!!

I can no longer enjoy my home outdoors, There is a constant "buzzing" that I cannot escape. The further that I walk onto my vacant land, the closer I get to the neighbors tower.

these towers make me feel constantly stressed and I always am anxious or have a feeling of anxiety.

I worry about my plummeting real estate value, and if a bank will even renew my mortgage when its time.

I'm in a position that if I complain, I fear that my property value will fall even further. [identifying comment left out]

myself and other members of my family are now getting unexplained headaches, even my [age] year old daughter who has never had a headache prior to these towers coming online I have a feeling of helplessness because I want to get away from the towers but we must remain due to the fact that we can't afford to abandon our home and move.

11) Our dog is restless constantly pacing

#133
9)[other symptoms]Lack of focus—Lack of Concentration Memory loss—High Blood Pressure—Nausea—Feeling of Fullness in the Head—Fullness Feeling in the ears

[approached doctor] Weekly pain clinic and migraine treatments. Pain medication for migraine. Nausea medication. Anti-hypertensive medication. Anti-depressant medication. Several types of pain medication. Acupuncture and Chinese Medication. Acupuncture bi-weekly.

(continued)

Appendix E (continued)

10) [life altered]

1. Lost my career, which I loved dearly. It was a part of my life since age 18. *A huge loss*
2. Lack of sleep has caused an enormous amount of stress, has impacted my everyday life from everyday appointments to social events + friendships, routines of living such as shopping, house cleaning, gardening; entertaining and family gatherings.
3. I was an avid reader but I cannot sit and concentrate to read a book.
4. I'm exhausted most of the time
5. I feel tense all the time.
6. My ill health has become a major focus of my life and I fear a major fear of having a stroke!
7. I don't have people in my home anymore.
8. All our needed home renovations are on hold.

Author's Note

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Bios

Carmen M. E. Krogh, BScPharm is a retired pharmacist with more than 40 years of experience in health. She has held senior executive positions at a major teaching hospital, a professional association and Health Canada. She was a former Director of Publications and Editor-in-chief of the *Compendium of Pharmaceuticals and Specialties (CPS)*, the book used in Canada by physicians, nurses and other health professions for prescribing information on medication.

Lorrie Gillis is the process administrator for the WindVOiCe health survey. Ms Gillis volunteers her time and ensures the processes for administering the protocols are maintained.

Nicholas Kouwen is a Distinguished Professor Emeritus in the Department of Civil and Environmental Engineering of the University of Waterloo, Waterloo, Ontario, Canada. He is a registered Professional Engineer (Ontario) and a Fellow of the American Society of Civil Engineers. His field of expertise is in hydraulic and hydrological modelling and is currently involved in studies dealing with the impact of climate change on water availability.

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However, the wealth accumulated would be quickly erased if the interested data gatherer had to give a dollar (or euro) to every distraught resident from homes surrounding wind turbines, who said, "I just cannot get used to the constant pounding "Whoosh Whoosh Whoosh" that I hear at night from those turbines. Even with my head under the pillow, it is an unwelcome intruder into our home!"

Given the assumption that regardless of their personal opinion one way or another about wind turbines, most people strive to tell the truth, how does the unbiased observer make sense of it all? The speakers cannot all be right, can they? The points of view are exactly divergent. It is too easy to fall into the trap so often set, to accuse the "other side" of not telling the truth, or of just using excuses to explain personal preferences. This paper attempts to provide an explanation to the quandary that is probably one of the greatest mysteries about wind turbines -- why they are not noisy to the person who stands under them in the daytime, and yet are unwelcome noisy intruders at night for the resident who lives near them.

It turns out that the explanation may not be so difficult to understand at all, and it may arise from a well-understood climatic condition that is familiar, but which is not well recognized in the acoustical codes prepared for wind turbines.

Common Explanations for Whoosh

A number of references describe the "Whoosh" heard from wind turbines as being due to the interaction between the turbulent air following the trailing edge of the wind turbine blade as it passes the region of slowed wind speed in front of the tower. Other explanations for the Whoosh have been written to describe it as being due to the acoustical Doppler effect, which arises as the wind turbine blades rotate on their downward path approaching an observer on the ground. A paper[i] by Stefan Oerlemans and Gerhard Schepers presented at the Second Wind Turbine Noise Conference in Lyons in 2007 describes the use of an elliptical array of microphones mounted on a board16 metres by 18 metres placed on the ground "roughly one rotor diameter upwind of turbines to measure sound from the blades to measure the distribution of noise sources in the rotor plane and on individual blades" to show that for an observer on the ground, "most of the noise is produced by the outer part of the blades (but not the very tip) during the downward motion." Their paper shows some pictures of the test set up and typical noise source distributions in the rotor plane.

None of the common explanations proposed to date have suggested a reason for the Whoosh to vary from day to night. As none could explain the anecdotal observations made by residents living near wind turbines, of noise being more pronounced at night, it was necessary to search further.

A New Player Enters the Field – Atmospheric Stability

During the 2007 Ontario Municipal Board hearings related to the appeal by citizens against the Municipality of Kincardine, Ontario zoning bylaws passed to permit erection of wind turbines on 105 lots by the Enbridge Ontario Wind Power development, Meteorological Consultant James W. S. Young Ph.D. P. Eng, presented a paper titled "Analysis of Boundary Layer Winds near Goderich and Their

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Third International Meeting
on
Wind Turbine Noise
Aalborg Denmark 17 – 19 June 2009

A New Explanation for Wind Turbine Whoosh – Wind Shear

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Abstract

The cyclic "Whoosh" created by wind turbines are their most recognizable audible feature, often reported as their most annoying aspect. Many references describe that the whoosh is generated due to the interaction between the turbulent air following the trailing edge of the blades, and the downwind tower.

However, this explanation leaves unanswered questions. Why is the whoosh so different from day to night? Neither the tower nor the blades change. A simple empirical test explains part of the mystery. Hold your finger in front of your pursed lips. As you blow on your finger at greater and lesser velocity, you hear that same familiar cyclic whoosh as you do from a wind turbine.

We know that at night the atmospheric profile changes, due to the condition of wind shear, as wind speed at height become uncoupled from lower elevations. We know also from audio / photographic studies that the sound from wind turbine blades is most concentrated at the blade tips.

When the bits we know are melded, a new model develops that explains how the cyclic whoosh of wind turbines can be described by the movement of the blades through high wind speeds at the top to low speeds at the bottom of the blade rotation. The sound increases as the blades go to the top of the circle and decreases as the blades go to the bottom of the cycle.

This knowledge might be used to reduce the annoying cyclic whoosh of wind turbines by a cyclical pitch of the blades as they reach the top of their rotation. This would also decrease stresses on the blades caused by flexure, and might even reduce blade failure probability.

Introduction

People who have followed the debate over wind turbines would readily agree that they would be rich if they had a dollar (or euro) for every article written or every hearing statement by someone saying something like "I went out to the turbine site, stood under the turbine, and could carry on a normal conversation. I don't know what all the fuss is about; there was only a gentle "swish" sound. They aren't noisy!"

Application to Wind Farms along the Easy Coast of Lake Huron."[ii] Figure 1 (adapted from Young) shows the first 1000 metres atmosphere above the surface of the earth.

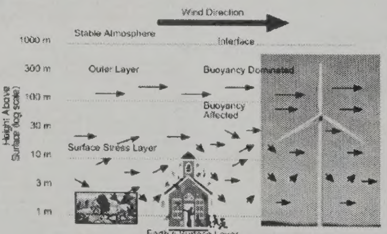


Figure 1 - Structure of Lower Atmosphere - Daytime

Young notes that above about 1000 metres we are in a stable layer of unchanging wind speeds with height, while below that level wind flow is dominated by either buoyancy or surface stress. He states, "The surface stress (or friction) dominates up to about 30 metres. Modern wind turbines typically operate above the surface stress layer in the buoyancy dominated region. In this region the wind flows tend to be less affected by turbulence (instabilities in the atmosphere)."

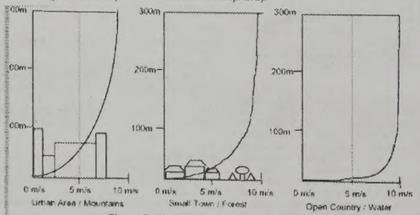


Figure 2 - Typical Daytime Wind Speed Profiles

Figure 2 (also adapted from Young's paper) describes the typical patterns that are exhibited by the wind velocity with height as the surface roughness varies over urban (or mountainous) areas, suburbs (or forest) and level country (or water). The figure shows higher wind speeds at lower elevations over flat smooth terrain or water which favours placement of wind turbines in such areas.

The wind velocity with height is normally explained by the power equation:

$$V_h / V_r = (h_h / h_r)^\alpha$$

where:

V_h = wind velocity at height h

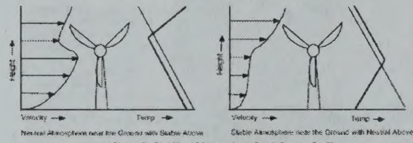
V_r = wind velocity at reference height (normally 10 metres)

h_h = height in question

h_r = reference height (normally 10 metres)

α = the wind shear coefficient

Young goes on to note that another factor needs to be considered, the stability of the atmosphere. This can be stable, neutral, or unstable. Figure 3 below, also adapted from Young's report, shows the conditions of a neutral atmosphere near the ground, with a stable atmosphere above, or a stable atmosphere near the ground with a neutral condition above.



Neutral Atmosphere near the Ground with Stable Above

Stable Atmosphere near the Ground with Neutral Above

Figure 3 - Stability of Atmosphere Can Influence Profile

The sketches in Figure 3 show that neither the wind velocity nor the temperature necessarily follow the power equation of a steadily increasing velocity with height, or the temperature relationship of a decreasing temperature with height. The figure shows a typical wind turbine with a hub height of about 80 metres, at the transition point between the stable and neutral atmosphere condition as might occur.

The temperature reference line shows that in a neutral atmosphere, the temperature can be expected to fall about 1°C per 100 metres, but in the stable atmosphere, the temperature can rise with height. (This is alternately described as a temperature inversion).

The condition of thermal stability above ground elevation can be referenced in other fields of science. The Encyclopaedia of Soil Science shows in an article on Erosion by Wind[iii] that "atmospheric conditions with neutral buoyancy are found with cloudy skies (which reduce radiative heating) and strong winds (which promote atmospheric mixing and prevent temperature stratification.)" It goes on to describe that "On clear and sunny days (especially in arid or semi-arid areas) strong radiative heating may result in thermal instability (with a steep temperature gradient) which increases buoyancy effects and vertically stretches turbulent eddies … Conversely, atmospheric stability (often occurring at night with radiative cooling of the surface) tends to squeeze turbulent eddies vertically resulting in a strong wind gradient with little vertical mixing."

Similarly, the doctoral dissertation "The Sounds of High Winds" by G.P van den Berg[iv] discusses the subject of atmospheric stability and notes, "Atmospheric stability has a profound effect on the vertical wind profile and on atmospherical turbulence strength." Van den Berg discusses both the power law function and the logarithmic wind profile. He notes that the power law has no real physical basis, and that it may not apply under all conditions. Similarly van den Berg notes that the logarithmic wind profile "is an approximation of the wind profile in the turbulent boundary layer of a neutral atmosphere."

Values of the wind shear coefficient α are related to stability classes as defined by the Pasquill classes by van den Berg or the Classification Company Det Norkse Veritas (DNV) as shown in the following table.

Pasquill Class	Name	DNV Class	Shear Coefficient α
A	Very unstable		0.09
		Unstable	0.16
B	Moderately unstable		0.20
C	Neutral	Neutral	0.22
D	Slightly stable		0.28
		Stable	0.35
E	Moderately stable		0.37
F	(Very) stable		0.41

A slightly different Pasquill Classification was defined in the paper by F. Pasquill "The estimation of the dispersion of windborne material"[v] in 1961.

Table 1. The Pasquill stability classes

Stability class	Definition	Stability class	Definition
A	very unstable	D	neutral
B	unstable	E	slightly stable
C	slightly unstable	F	stable

Table 2. Meteorological conditions that define the Pasquill stability classes

Surface wind speed		Daytime incoming solar radiation			Nighttime cloud cover	
m/s	mi/h	Strong	Moderate	Slight	> 50%	< 50%
< 2	< 5	A	A – B	B	E	F
2 – 3	5 – 7	A – B	B	C	E	F
3 – 5	7 – 11	B	B – C	C	D	E
5 – 6	11 – 13	C	C – D	D	D	D
> 6	> 13	C	D	D	D	D

Note: Class D applies to heavily overcast skies, at any wind speed day or night

The issue of atmospheric stability is an important one for predicting the impacts of releases from chemical facilities, fires, and nuclear facilities. The "Safety Report" of Bruce Nuclear Generating Station A[vi], for example, shows the prevalence of stability class E and F. The 1994 issue of the Safety Report, shows stability classes E and F occurring with the following frequency (based on 4 to 9 years of data for each):

London Ontario	28.4% of the time
Mount Forest Ontario	27.3% of the time
Muskoka Ontario	27.9% of the time
Sudbury Ontario	22.1% of the time
Flint, Michigan	28.5% of the time
Wiarton, Ontario	24.5% of the time

In the 2003 reissue of the "Safety Report"[vii] atmospheric stability was calculated using the Sigma Theta (σ_θ) method, as dictated by the US NRC and US EPA. Using this method the frequency of occurrence of Atmospheric Stability Classes E and F for Wiarton Ontario in the preceding 4 year period was E = 9.3% and F = 9.1%.

Since by definition Pasquill Class E and F can only exist at night (which is less than half of a day in Ontario), the fact that these conditions exist between 18.4 to 28.4% of the time in total in Ontario, suggest that they apply for over half of all nights.

Modelling Atmospheric Stability

It is clear that neither the normal power equation (described above), nor the common logarithmic relationship for wind speed as a function of vertical elevation from International Standard IEC 61400-11 shown below provide any transition to describe the change in atmospheric conditions that occur when atmospheric stability occurs.

$$V_s = V_z \left[\frac{\ln\{Z_{ref}/Z_{oref}\} \ln\{H/Z_o\}}{\ln\{H/Z_{oref}\} \ln\{z/z_o\}} \right]$$

where:

Z_{oref} is the reference roughness length of 0.05 m

Z_o is the roughness length

H is the rotor centre height

Z_{ref} is the reference height, 10 m

Z is the anemometer height

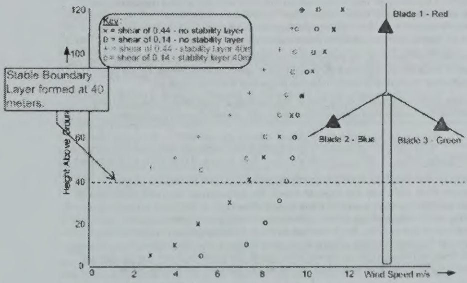


Figure 4 - Effect of Shear and Stability on Incident Wind Speed

Figure 4, on the previous page shows the effect of varying wind shear and on the stability level on the wind speed in metres per second at increasing heights above ground. For the case of no stable layer in the lower atmosphere, the case has been shown where for shears of 0.14 (nominally a neutral atmosphere) and for 0.44 (a stable atmosphere), plotting both cases for the same wind speed of 10 metres per second at the 80 metre hub height of a wind turbine. The curve labelled with the "o"s show that for the case of the wind shear of 0.14 (neutral atmosphere) this corresponds to a wind speed of about 7.5 metres per second at 10 metres above the ground, while for the wind shear of 0.44 (stable atmosphere) the curve labelled with the "x"s shows a wind speed of 10 metres second at 80 metres corresponds to a wind speed of 4 metres per second at 10 metres above the ground. The two shifted curves noted by the "+" and "c" symbols show the case of atmospheric stability that can occur on the majority of nights as shown above for the case of Southern Ontario.

In this case, the wind speed may be low up to the level of the top of the stable layer. This is a familiar phenomenon seen in the smoke that rises vertically from a campfire on the ground or a low chimney at night before sharply changing direction when it reaches the top of the stable layer. The power law is applied as before to calculate the wind speeds above the top of the stable layer once the atmosphere again becomes either neutral or unstable.

Sketched beside the curves of wind speed, as a function of height is a normal wind turbine, with a hub height of 80 metres and a blade diameter of 82 metres. Observation of this figure shows that during the neutral atmosphere with a shear of 0.14 and no stable layer (typical of daytime hours) the wind speed is roughly the same from the top to the bottom of the turbine rotor (varying less than 10% from the top to the bottom of the blade circle.) However, during the condition of a stable atmosphere that can exist on the majority of nights, the variation of incident wind speed across the turbine rotor varies significantly more, ranging from 33% to over 100%. Not only does this variation of wind speed cause high mechanical stresses across the rotor at night as reported by the United States National Renewable Energy Laboratory[viii] it can be shown that it has an impact on the "Whoosh" noise.

Showing the Effect of Stability on Noise

In "The Sounds of High Winds" van den Berg shows the strong influence between angle of attack (the angle between the incoming air flow and the blade chord)[ix] and wind turbine noise in a stable atmosphere. In Figure III.2 of his paper (adapted as Figure 5 below), the local wind velocity divided by the air velocity due to rotation is seen to be the tangent of the flow angle φ.

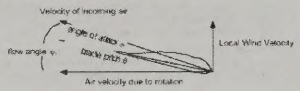


Figure 5 - Air Flow Over Turbine Blade

To display the result of atmospheric stability on the noise produced, an Excel spreadsheet was created to calculate the wind speed incident on the turbine blades as they rotate, in both daytime neutral cases and at night when a stable level is created in the atmosphere typical of the case shown in Figure 4. For simplicity, the turbine blades were designated as the Red, Blue and Green blade, and the elevation was calculated for the point 75% of the distance from the hub on the turbine blade (recognizing the work by Oerlemans / Schepers) for one full rotation of the turbine rotor at each 30-degree increment of the rotation. The rotation direction is clockwise with the Blue blade following the Red blade. See Photos 1 and 2 at the end of the text. The example of a turbine with an 82 metre rotor diameter was used, typical of wind turbines being installed today in Ontario -- the Vestas V82, or the Enercon E82.

The wind speed at the location of each of the three turbine blades was then calculated, for the cases of a wind shear of 0.14, 0.26, and 0.44, and for a stable layer at 0 metres, 20 metres and 40 metres, to give 9 cases. The wind speed was calculated using an assumption that the wind speed is constant (and low) up to the top of the stable atmosphere layer, then to increase as given by the power law. The increase is described by the wind shear α after that point. Calculations were made for wind shears from 0.14 to 0.44 (typical of shears shown to exist in the paper[x] presented at 2007 at the Wind Turbine Noise Conference). Actually, the work by Young, presented at the Ontario Municipal Board in 2007 showed that in a number of cases, the wind shear α was greater than 1.0.

Once the local wind speed was calculated incident upon each blade, then the velocity of incoming air was calculated as the resultant vector from combining the local wind velocity and the air velocity due to rotation of the blade. This assumed the rotational speed of 14.4 revolutions per minute at the point 75% from the hub on each 41 metre blade as about 45 metres per second.

Then the "flow angle" of the airflow over the turbine blade was calculated from the tangent relationship described above (the local wind velocity divided by the air velocity due to rotation is seen to be the tangent of the flow angle φ).

In Table B1 of appendix B of his paper "the Sounds of High Winds" van den Berg describes the increase of trailing edge sound with angle of attack α as follows.

A	1°	2°	3°	4°	5°	6°	7°	8°	9°
$\Delta SPL_{TE}(\alpha)$ (dB)	0.4	1.4	2.9	4.6	6.4	8.0	9.4	10.6	11.5

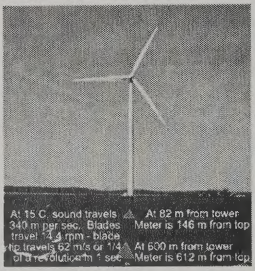
Since van den Berg identifies a linear relationship between the added sound pressure level ΔSPL and the angle of attack, the spreadsheet data was then used to add the angle of attack for each of the three turbine blades for the nine cases of varying wind shear and top of the stable layer. While this would not produce an actual sound power level, the intent was to show the change in the summed flow angles as the blades rotate. Since for modern turbines, the blade pitch does not vary other than for changing power levels, changes in the angle of attack can be derived from changes in the total flow angle as the air passes over the turbine blade.

The results of the curves are discussed in the observations, below. The spreadsheet data is available from the author.

Observations

Chart 1 plots the summed flow angle from all three turbine blades at each rotary position for the nine cases examined. For the assumption of the same 10 metre per second air flow at the 80 metre hub level of the turbine, the greatest summed flow angle exists for the case of the lowest wind shear, as expected since for this case the wind velocity is most constant across the entire turbine rotor. This condition results in the least variation in the summed flow angle as the rotor goes through its circular circuit, and thus a "swish" of little variation. Chart 1 shows that as a stable level in the atmosphere is created, the variation in the summed angle of flow becomes more apparent, and the "Whoosh" would become more apparent. Again, the Chart shows that the greatest summed flow angles are calculated for the smallest wind shear. This is largely a result of the method of calculation, which assumes the same 10 metres per second at the 80 metre level for the case with no stable level.

Chart 2 makes it clear that the most significant changes in the normalized sum of the Angle of Flow exists for the case with the largest wind shear and the top of the stable level at 40 metres. The high shear, coupled with a stable atmosphere produces much more variable effect in the flow angle. Since this is the predominant cause of the turbulent flow condition, and hence the noise, it produces a cyclic nature of the sound. Chart 2 shows that the highest normalized sum for the Angle of Flow occurs when the blades pass the top of their path, and is lowest when the blades pass the bottom of the path. This is contrary to the finding of Oerlmans and Schepers, who determined that "most of the noise is produced by the outer part of the blades during the downward motion" as noted earlier. Figure 6 suggests an explanation of the discrepancy.


At 15 C, sound travels 340 m per sec. Blades travel 14.4 rpm - blade tip travels 62 m/s or 1/4 of a revolution in 1 sec
At 82 m from tower Meter is 146 m from top
At 600 m from tower Meter is 612 m from top

ObserverDistance	Rotation when Sound Arrives
82 m	0.4 sec = 0.1 revolution
200 m	0.7 sec = 0.2 rev
400 m	1.2 sec = 0.3 rev
600 m	1.8 sec = 0.4 rev

Figure 6 - Apparent rotation at distance

Field observations taken to confirm the conclusions of this report at a distance of about 400 metres from the turbine pictured did appear to indicate that the "Whoosh" was most pronounced as each blade passed the 4 o'clock position (or 120 to 150 degrees). However, when one considers that at 15°C sound travels at 340 metres per second, one recognizes that at a distance of 400 m the sound takes 1.2 seconds to reach the observer, and in that time, the turbine blade rotates 0.3 revolution. What certainly sounded to this observer to be a sound loudest during the downward motion with the "Whoosh" occurring about the 4 o'clock position, means that the sound was actually generated 0.3 of a revolution earlier, as the blade was just passing the top of its path. This confirms the calculation performed in this report, and supports the observation that the greatest sum of the flow angle, and thus the summed angle of attack occurs when the blades pass the top of the rotation.

One sees that an explanation of the night time "Whoosh Whoosh Whoosh" compared to the daytime gentle "swish swish swish" becomes clear. When the normalized daytime case, for the neutral or turbulent atmosphere is examined, the fluctuation in flow angle, and hence sound levels is barely evident, while the nighttime case with a stable level in the atmosphere case shows a very pronounced cyclic nature.

Conclusions

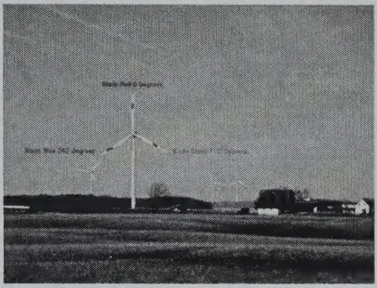
The anecdotal evidence that wind turbines are more annoying at night, and that the "Whoosh" is more pronounced at night cannot be fully explained by the normal power law, the logarithmic change in velocity with height, by Doppler effects, or by the creation of sound towards the outer limits of the turbine blade on downward motion.

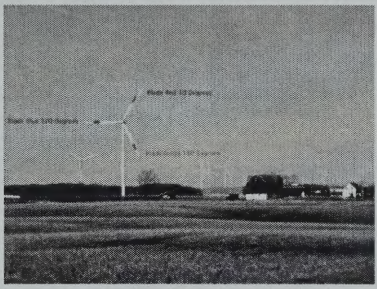
The explanation of the cyclic nature of the "Whoosh Whoosh Whoosh" can be found in the cyclical change of the sound level that occurs, particularly at night, as a stable atmosphere is created. The stable atmosphere creates the greatest change in the summed angle of attack considering the contribution of each blade taken together, as is heard by an observer. This paper has shown that this condition of a stable atmosphere occurs on the majority of nights in Ontario (and likely occurs elsewhere with a similar frequency, as climatic conditions do not observe political boundaries).

The model results displayed in this paper show that when a stable atmosphere exists at night time, the cyclic nature of the sound from wind turbines is more pronounced than it is in the daytime when a stable level in the atmosphere does not exist. Human hearing is capable of resolving a wide variation of sounds, and is particularly sensitive to changes in sound level. Previous work by van den Berg, Pedersen, Bouma, and Bakker, "WINDFARMperception"[xi] published in 2008 showed that "in general respondents perceived wind turbines as being louder in wind blowing from the turbine to their dwelling (and less loud the other way around), in stronger wind ***and at night***." The report also stated, "In this survey sound was the most annoying aspect of wind turbines. From this and previous studies it appears that sound from wind turbines is relatively annoying: at the same sound level it causes more annoyance than sound from air or road traffic. ***A swishing characteristic is observed by three out of four respondents that can hear the sound*** and could have been one of the factors explaining the annoyance."

The existence of this condition as shown in this report reinforces the need to apply a penalty to the average sound received from wind turbines at night because the cyclic "Whoosh" produced during stable atmospheres makes them particularly noticeable and annoying, compared to other noise sources.

Photographs





Charts

Chart 1 – Summed Angle of Flow as Turbine Rotates

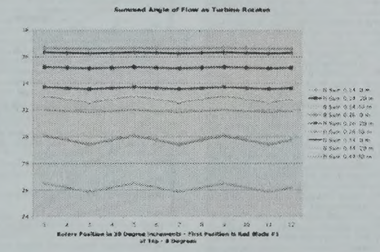
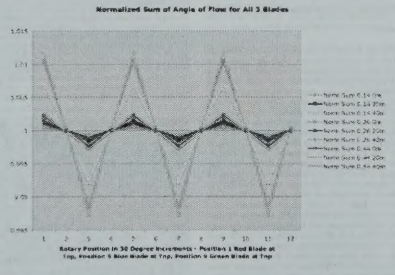


Chart 2 – Normalized Sum of Angle of Flow for All 3 Blades



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- George Kamperman, Acoustical Consultant, Wisconsin Dells, WI, USA
- Nick Kouwen, Professor Emeritus, Civil and Environmental Engineering, University of Waterloo, ON, Canada
- Stefan Oerlemans, National Aerospace Laboratory, NLR, The Netherlands
- Gerard Schepers, ECN Wind Energy, The Netherlands
- G.P. (Frits) van den Berg, University of Groningen, The Netherlands
- Jim Young, Meteorological Consultant, Kincardine ON, Canada

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[i] Oerlemans, Stefan and Schepers, Gerard. "Prediction of Wind Turbine Noise and Comparison to Experiment" presented at the Second international Meeting on Wind Turbine Noise, Lyon France, September 2007

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[v] Pasquill, F. (1961). "The estimation of the dispersion of windborne material." The Meteorological Magazine, vol 90, No. 1063, pp 33-49.

[vi] Bruce Generating Station A Safety Report, Chapter 1, Site Evaluation, Section 2, "Factors Affecting a Release" 1994 Edition, subsection 2.2.1.6 "Atmospheric Stability".

[vii] Bruce Nuclear Generating Station A Safety Report, NK21-SR-01320-00001, Rev 002, July 4, 2003, predicts stability class using the Sigma Theta (σ_θ) method as defined by the US NRC (Nuclear Regulatory Commission) Proposed Revision 1 to Regulatory Guide 1.23: Meteorology Programs in Support of Nuclear Power Plants, 1980, and the US EPA (Environmental Protection Agency) "Guidelines on Air Quality Models" Report No. EPA-450/2-78-027R, Table 9-3, pp 9-21, 1986.

[viii] Kelley N. Smith B. Smith K, Randall G, Malcolm D. "Evaluation of Wind Shear Patterns at Midwest Wind Energy Facilities" National Renewable Energy Laboratory, US Department of Energy, May 2002. Paper NREL/CP-500-32492.

[ix] Van den Berg G.P. . "The Sounds of High Winds, the effect of atmospheric stability on wind turbine sound and microphone noise" submitted as a doctoral dissertation to the University of Groningen, May 12, 2006 (previously also listed as Reference iv) discusses angle of attack and stability on noise in Chapter III, Chapter V, and Appendix B.

[x] Palmer, William K.G. "Uncloaking the Nature of Wind Turbines – Using the Science of Meteorology" presented at the Second International Meeting on Wind Turbine Noise, Lyon, France, September 2007.

[xi] Van den Berg F, Pedersen E, Bouma J, Bakker R, "WINDFARMperception – Visual and acoustic impact of wind turbine farms on residents" University of Groningen, FP6-2005-Science-and-Society-20, Specific Support Action, Project no. 044628, Final Report, June 3, 2008.

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Review Article

Responses of the ear to low frequency sounds, infrasound and wind turbines

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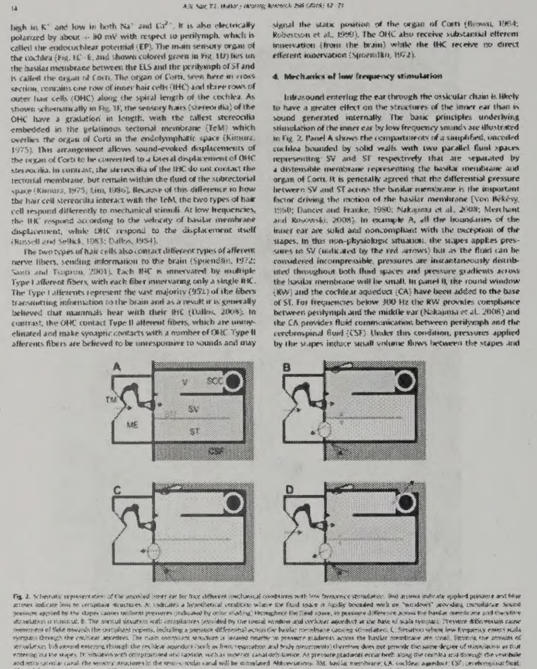

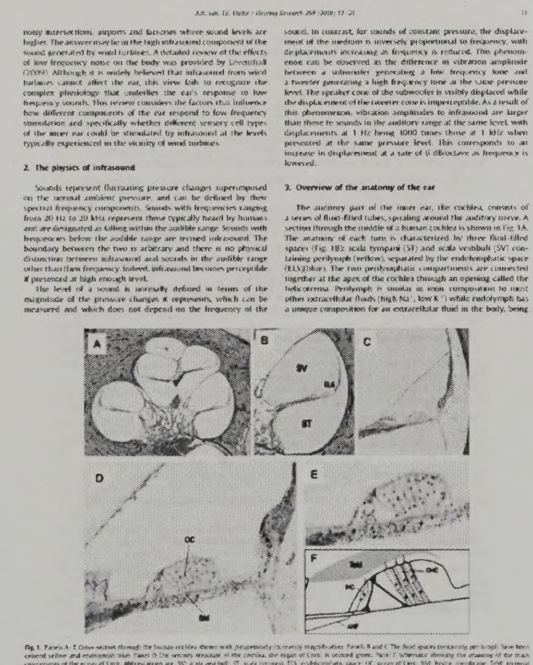

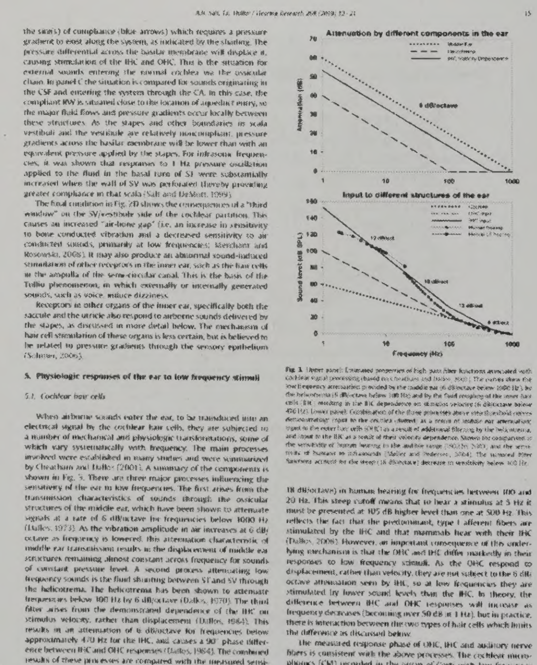

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OHC-generated potentials, which follow the displacement of the basilar membrane (Dallos et al., 1972). In contrast, intracellular responses from the IHC lead the organ of Corti CM response by an amount which approaches 90° as frequency is reduced to 100 Hz (Dallos, 1984) corresponding to maximal basilar membrane velocity towards SV (Nuttall et al., 1981). As frequency is lowered, the intracellular potentials of IHC and afferent fiber responses show phase changes consistent with the IHC no longer responding to the increasingly attenuated velocity stimulus, but instead responding to the extracellular potentials generated by the OHC (Sellick et al., 1982; Cheatham and Dallos, 1997). A similar change of phase as frequency is lowered was reported in human psychophysical measurements (Zwicker, 1977) with masking patterns differing by approximately 90° for frequencies above and below 40 Hz. This transition from a response originating from mechanical stimulation of the IHC, to one originating from electrical stimulation of the IHC by large extracellular responses from the OHC may account for the transition of low frequency sensitivity in humans from 18 dB/octave above 20 Hz to 12 dB/octave below 10 Hz (Møller and Pedersen, 2004) (Fig. 3B). Near 10 Hz the IHC transition to become primarily stimulated by the more sensitive OHC responses. It can be inferred that if extracellular voltages generated by the OHC are large enough to electrically stimulate the IHC at a specific frequency and level, then the lowest level that the OHC respond to at that frequency must be substantially lower. Based on this understanding of how the sensitivity of the ear arises, one conclusion is that at low frequencies the OHC are responding to infrasound at levels well below those that are heard. On the basis of the calculated input to OHC in Fig. 3B, it is possible that for frequencies around 5 Hz, the OHC could be stimulated at levels up to 40 dB below those that stimulate the IHC. Although the OHC at 1 kHz are approximately 12 dB less sensitive than IHC (Dallos, 1984), this difference declines as frequency is lowered and differences in hair cell sensitivity at very low frequencies (below 200 Hz) have not been measured.

Much of the work understanding how the ear responds to low frequency sounds is based on measurements performed in animals. Although low frequency hearing sensitivity depends on many factors including the mechanical properties of the middle ear, low frequency hearing sensitivity has been shown to be correlated with cochlear length for many species with non-specialized cochleas, including humans and guinea pigs (West, 1985; Echteler et al., 1994). The thresholds of guinea pig hearing have been measured with stimulus frequencies as low as 50 Hz, as shown in Fig. 4A. The average sensitivity at 125 Hz for five groups in four studies (Heffner et al., 1971; Miller and Murray, 1966; Walloch and Taylor-Spikes, 1976; Prosen et al., 1978; Fay, 1988) was 37.9 dB SPL, which is 17.6 dB less sensitive than the human at the same frequency and is consistent with the shorter cochlea of guinea pigs. In the absence of data to the contrary, it is therefore reasonable to assume that if low frequency responses are present in the guinea pig at a specific level, then they will be present in the human at a similar or lower stimulus level.

5.2. Cochlear microphonic measurements

Cochlear microphonics (CM) to low frequency tones originate primarily from the OHC (Dallos et al., 1972; Dallos and Cheatham, 1976). The sensitivity of CM as frequency is varied is typically shown by CM isopotential contours, made by tracking a specified CM amplitude as frequency is varied. Fig. 4B shows low frequency CM sensitivity with two different criteria (Dallos, 1973: 3 μV; Salt et al., 2009: 500 μV). The decrease in CM sensitivity as frequency is lowered notably follows a far lower slope than that of human hearing over the comparable frequency range. In the data from Salt et al. (2009), the stimulus level differences between 5 Hz and 500 Hz average only 34 dB (5.2 dB/octave), compared to the 105 dB difference (15.8 dB/octave) for human hearing over the same range. Although these are suprathreshold, extracellular responses, based on an arbitrary amplitude criterion, these findings are consistent with the OHC having a lower rate of cutoff with frequency than the IHC, and therefore responding to lower level stimuli at very low frequencies.

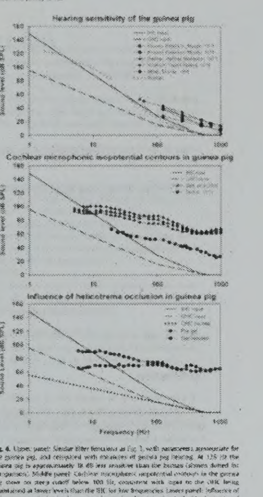

Fig. 4. Upper panel: Similar filter functions as Fig. 3, with parameters appropriate for the guinea pig, and compared with measures of guinea pig hearing. At 125 Hz the guinea pig is approximately 18 dB less sensitive than the human (shown dotted for comparison). Middle panel: Cochlear microphonic isopotential contours in the guinea pig show no steep cutoff below 100 Hz, consistent with input to the OHC being maintained at lower levels than the IHC for low frequencies. Lower panel: Influence of helicotrema occlusion in the guinea pig, produced by injecting 2 μL of hyaluronate gel into the cochlear apex, on the CM isopotential function. Also shown for comparison is the estimated input sensitivity for the OHC with the attenuation by the helicotrema excluded. CM sensitivity curves both have lower slopes than their predicted functions, but the change caused by helicotrema occlusion is comparable.

The measured change in CM sensitivity with frequency may include other components, such as a contribution from transducer adaptation at the level of the OHC stereocilia (Kros, 1996). Kennedy et al. (2005) have suggested that adaptation of the mechano-electrical transducer channels is common to all hair cells and contributes to driving active motion of the hair cell bundle. Based on their measurements in cells isolated from the apical turns of neonatal rats, they estimated that the adaptation caused high-pass filtering with a low frequency cutoff frequency of 2/3 of the best frequency for the cochlear location. This type of adaptation, however, does not appear to provide additional attenuation at very low frequencies, as inferred from CM sensitivity curves measured down to 5 Hz. On the contrary, the CM sensitivity curve appears to flatten below 10 Hz, a phenomenon which is currently under investigation in our laboratory.

Fig. 4C shows the influence of plugging the helicotrema with gel on CM sensitivity with frequency, recorded from the basal turn of a guinea pig with a 500 μV criterion (Salt et al., 2009). These relative sensitivity changes, combined with a 90° phase shift in responses, replicate those of Franke and Dancer (1982) and demonstrate the contribution to attenuation provided by the helicotrema for frequencies below approximately 100 Hz. This contrasts with a prior suggestion that the helicotrema of the guinea pig was less effective than that of other species (Dallos, 1970). While the above CM measurements were made with the bulla open, measurements made in both the bulla open/closed conditions with closed sound-field stimulation suggest there is no pronounced frequency dependence of the difference between these conditions below 300 Hz although there may be a level difference of 5–15 dB (Dallos, 1973; Wilson and Johnstone, 1975).

5.3. Low frequency biasing, operating point, and distortion generation

As a result of the saturating, nonlinear transducer characteristic of cochlear hair cells (Russell and Sellick, 1983; Kros, 1996), the fidelity of cochlear transduction depends highly on the so-called operating point of the cochlear transducer, which can be derived by Boltzmann analysis of the CM waveform (Patuzzi and Moleirinho, 1998; Patuzzi and O'Beirne, 1999). The operating point can be regarded as the resting position of the organ of Corti or its position during zero crossings of an applied stimulus (which may not be identical, as stimulation can itself influence operating point). Small displacements of operating point have a dramatic influence on even-order distortions generated by the cochlea ($2f$, f_2-f_1) while having little influence on odd-order distortions ($3f$, $2f_1-f_2$) until displacements are large (Frank and Kössl, 1996; Sirjani et al., 2004). Low frequency sounds (so-called bias tones) have been shown to modulate distortion generated by the ear by their displacement of the operating point of the organ of Corti (Brown et al., 2009). In normal guinea pigs, 4.8 Hz bias tones at levels of 85 dB SPL have been shown to modulate measures of operating point derived from an analysis of CM waveforms (Brown et al., 2009; Salt et al., 2009). This is a level that is substantially below the expected hearing threshold of the guinea pig at 4.8 Hz. In animals where the helicotrema was occluded by injection of gel into the perilymphatic space at the cochlear apex, even lower bias levels (down to 60 dB SPL) modulate operating point measures (Salt et al., 2009). These findings are again consistent with the OHC being the origin of the signals measured and the OHC being more responsive to low frequency sounds than the IHC. A similar hypersensitivity to 4.8 Hz bias tones was also found in animals with surgically-induced endolymphatic hydrops (Salt et al., 2009). This was thought to be related to the occlusion of the helicotrema by the displaced membranous structures bounding the hydropic endolymphatic space in the apical turn. In some cases of severe hydrops, Reissner's membrane was seen to herniate into ST. As endolymphatic hydrops is present both in patients with Meniere's disease and in a significant number of asymptomatic patients (Merchant et al., 2005), the possibility exists that some individuals may be more sensitive to infrasound due the presence of endolymphatic hydrops.

In the human ear, most studies have focused on the $2f_1-f_2$ distortion product, as even-order distortions are difficult to record in humans. The $2f_1-f_2$ component has been demonstrated to be less sensitive to operating point change (Sirjani et al., 2004; Brown et al., 2009). Using different criteria of bias-induced distortion modulation, the dependence on bias frequency was systematically studied in humans for frequencies down to 25 Hz, 6 Hz and 15 Hz respectively (Bian and Scherrer, 2007; Hensel et al., 2007; Marquardt et al., 2007). In each of these studies, the bias levels required were above those that are heard by humans, but in all of them the change of sensitivity with frequency followed a substantially lower slope than the hearing sensitivity change as shown in Fig. 5. Again this may reflect the OHC origins of acoustic emissions, possibly combined with the processes responsible for the flattening of equal loudness contours for higher level stimuli, since the acoustic emissions methods are using probe stimuli considerably above threshold. Although in some regions, slopes of 9–12 dB/octave were found, all showed slopes of 6 dB/octave around the 20 Hz region where human hearing falls most steeply at 18 dB/octave. It should also be emphasized that each of these studies selected a robust modulation criterion and was not specifically directed at establishing a threshold for the modulation response at each frequency. Indeed, in the data of Bian and Scherrer (2007) (their Fig. 3), significant modulation can be seen at levels down to 80 dB SPL at some of the test frequencies. In one of the studies (Marquardt et al., 2007) equivalent measurements were performed in guinea pigs. Although somewhat lower slopes were observed in guinea pigs it is remarkable that stimulus levels required for modulation of distortion were within 5–10 dB of each other for guinea pigs and humans across most of the frequency range. In this case the guinea pig required lower levels than the human. Although the threshold of sensitivity cannot be established from these studies, it is worth noting that for distortion product measurements in the audible range, "thresholds" typically require stimulus levels in the 35–45 dB SPL range (Lonsbury-Martin et al., 1990). In the Marquardt study, the bias tone level required at 500 Hz is over 60 dB above hearing threshold at that frequency.

5.4. Feedback mechanisms stabilizing operating point

The OHC not only transduce mechanical stimuli to electrical responses, but also respond mechanically to electrical stimulation (reviewed by Dallos, 2008) in a manner that provides mechanical amplification. This "active tuning" primarily enhances responses to high stimulus frequencies and is thought to provide little or no active gain with stimuli below approximately 1 kHz (Sellick et al., 2006). For low frequency stimulation, however, basilar membrane modulation by the low frequency tone does have a major influence on the mechanics at the best frequency of high frequency tones i.e. on the active tuning process (Patuzzi et al., 1984). It has been suggested that slow mechanical movements of the OHC may play a part in stabilizing the operating point of the transducer (LePage, 1987, 1989) so the OHC may participate in an active cancellation of low frequency sounds. In models of the cochlear transducer, it was proposed that negative feedback occurred at low frequencies (in which the OHC opposed movements of the basilar membrane), which becomes a positive feedback at the best frequency for the region (Mountain et al., 1983). Chan and Hudspeth (2005) have also suggested OHC motility may be exploited to maintain the operating point of a fast amplifier in the hair cell bundle. However, this possibility has recently been questioned by Dallos (Ashmore et al., 2010) for a number of reasons, one of which is the somatic motor protein, prestin, has an extremely fast response capability. So the interrelationships between hair cell motility and transduction, and between OHC and IHC remain an intense focus of current research. For low frequencies, it has been shown that an out-of-phase motion exists between the IHC reticular lamina and the overlying TM so that electromechanical action of the OHC may stimulate the IHC directly, without involvement of the basilar membrane (Nowotny and Gummer, 2006). The possible roles of the OHC and efferent systems are made more complex by recent findings of reciprocal synapses between OHC and their efferent terminals, seen as afferent and efferent synapses on the same fiber (Thiers et al., 2008). One explanation for this system is that the synapses may locally (without involvement of the central nervous system) coordinate the responses of the OHC population so that optimum operating point is maintained for high frequency transduction.

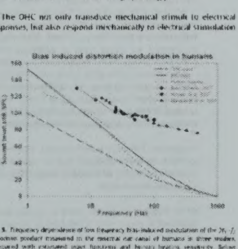

Fig. 5. Frequency dependence of low frequency bias-induced modulation of the $2f_1-f_2$ distortion product measured in the external ear canal of humans in three studies, compared with estimated input functions and human hearing sensitivity. Below 300 Hz the sensitivity to bias falls off at a much lower slope than human hearing, consistent with the response originating from OHC with a lower cutoff slope.

There is some evidence for active regulation of operating point based on the biasing of acoustic emission amplitudes by low frequency tones in which a "hysteresis" was observed (Bian et al., 2004). The hysteresis was thought to result from active motor elements, either in the stereocilia or the lateral wall of the OHC, shifting the transducer function in the direction of the bias. A similar hysteresis was also reported by Lukashkin and Russell (2005) who proposed that a feedback loop was present during the bias that keeps the operating point at its most sensitive region, shifting it in opposite directions during compression and rarefaction phase of the bias tone thereby partially counteracting its effects.

If there are systems in the cochlea to control operating point as an integral component of the amplification process, they would undoubtedly be stimulated in the presence of external infrasound.

5.5. Vestibular function

The otolith organs, comprising of the saccule and utricle, respond to linear accelerations of the head (Uzun-Coruhlu et al., 2007) and the semi-circular canals respond to angular acceleration. These receptors contribute to the maintenance of balance and equilibrium. In contrast to the hair cells of the cochlea, the hair cells of the vestibular organs are tuned to very low frequencies, typically below 30 Hz (Grossman et al., 1988). Frequency tuning in vestibular hair cells results from the electrochemical properties of the cell membranes (Manley, 2000; Art and Fettiplace, 1987) and may also involve active mechanical amplification of their stereociliary input (Hudspeth, 2008; Rabbitt et al., 2010). Although vestibular hair cells are maximally sensitive to low frequencies they typically do not respond to airborne infrasound. Rather, they normally respond to mechanical inputs resulting from head movements and positional changes with their output controlling muscle reflexes to maintain posture and eye position. At the level of the hair cell stereocilia, although vibrations originating from head movements and low frequency sound would be indistinguishable, the difference in sensitivity lies in the coupling between the source stimulus and the hair cell bundle. Head movements are efficiently coupled to the hair cell bundle, while acoustic stimuli are inefficiently coupled due to middle ear characteristics and the limited pressure gradients induced within the structure with sound stimuli (Sohmer, 2006).

In a similar manner to cochlear hair cells, which respond passively (i.e. without active amplification) to stimuli outside their best frequency range, vestibular hair cells respond passively to stimuli outside their best frequency range. The otolith organs have been shown to respond to higher, acoustic frequencies delivered in the form of airborne sounds or vibration. This has been demonstrated in afferent nerve fiber recordings from vestibular nerves (Young et al., 1977; McCue and Guinan, 1994; Curthoys et al., 2006) and has recently gained popularity as a clinical test of otolith function in the form of vestibular evoked myogenic potential (VEMP) testing (Todd et al., 2003; Zhou and Cox, 2004; Curthoys, 2010).These responses arise because higher frequency stimuli are more effectively coupled to the otolithic hair cells. But as sound or vibration frequency is reduced, its ability to stimulate the vestibular organs diminishes (Murofushi et al., 1999; Hullar et al., 2005; Todd et al., 2008). So for very low frequencies, even though the hair cell sensitivity is increasing as active tuning is invoked, mechanical input is being attenuated. While there have been many studies of vestibular responses to physiologic stimuli (i.e. head accelerations, rotations, etc) comprising of infrasonic frequency components, we are unaware of any studies that have directly investigated vestibular responses to airborne infrasound of similar frequency composition. As people do not become unsteady and the visual field does not blur when exposed to high-level infrasound, it can be concluded that sensitivity is extremely low.

In some pathologic conditions, coupling of external infrasound may be greater. It is known that "third window" defects, such as superior canal dehiscence increase the sensitivity of labyrinthine receptors to sounds (Wit et al., 1985; Watson et al., 2000; Carey et al., 2004), and are exhibited as the Tullio phenomenon (see earlier section). To our knowledge, the sensitivity of such patients to controlled levels of infrasound has never been evaluated. In this respect, it needs to be considered that vestibular responses to stimulation could occur at levels below those that are perceptible to the patient (Todd et al., 2008).

5.6. Inner ear fluids changes

Some aspects of cochlear fluids homeostasis have been shown to be sensitive to low frequency pressure fluctuations in the ear. The endolymphatic sinus is a small structure between the saccule and the endolymphatic duct which has been implicated as playing a pivotal role in endolymph volume regulation (Salt, 2005). The sinus has been shown to act as a valve, limiting the volume of endolymph driven into the endolymphatic sac by pressure differences across the endolymphatic duct (Salt and Rask-Andersen, 2004). The entrance of saccular endolymph into the endolymphatic sac can be detected either by measuring the K^+ concentration in the sac (as saccular endolymph has substantially higher K^+ concentration) or by measuring hydrostatic pressure. The application of a sustained pressure to the vestibule did not cause K^+ elevation or pressure increase in the sac, confirming that under this condition, flow was prevented by the membrane of the sinus acting as a valve. In contrast, the application of 5 cycles at 0.5 Hz to the external ear canal, caused a K^+ increase in the sac, confirming that oscillation of pressure applied to the sinus allowed pulses of endolymph to be driven from the sinus into the endolymphatic sac. The pressure changes driving these pulses was large, comparable to those produced by contractions of the tensor tympani muscle, as occurs during swallowing. Tensor tympani contractions produce displacements of the stapes towards the vestibule for a duration of approximately 0.5 s (~2 Hz), which induce large EP changes and longitudinal movements of endolymph within the cochlea (Salt and DeMott, 1999). The lowest sound level that drives endolymph movements is currently unknown.

A therapeutic device (the Meniett: www.meniett.com; Odkvist et al., 2000) that delivers infrasound to the inner ear is widely used to treat Meniere's disease in humans (a disease characterized by endolymphatic hydrops). The infrasonic stimulus (6 Hz or 9 Hz) is delivered by the device in conjunction with sustained positive pressure in the external canal. An important aspect of this therapy, however, is that a tympanostomy tube is placed in the tympanic membrane before the device is used. The tympanostomy tube provides an open perforation of the tympanic membrane which shunts pressure across the structure, so that ossicular movements (and cochlear stimulation) are minimized, and the pressures are applied directly to the round window membrane. Nevertheless, the therapeutic value of this device is based on infrasound stimulation influencing endolymph volume regulation in the ear.

As presented above, endolymphatic hydrops, by occluding the perilymph communication pathway through the helicotrema, makes the ear more sensitive to infrasound (Salt et al., 2009). It has also been shown that non-damaging low frequency sounds in the acoustic range may themselves cause a transient endolymphatic hydrops (Flock and Flock, 2000; Salt, 2004). The mechanism underlying this volume change has not been established and it has never been tested whether stimuli in the infrasound range cause endolymphatic hydrops.

Although infrasound at high levels apparently does not cause direct mechanical damage to the ear (Westin, 1975; Jauchem and Cook, 2007) in animal studies it has been found to exacerbate functional and hair cell losses resulting from high level exposures of sounds in the audible range (Harding et al., 2007). This was explained as possibly resulting from increased mixture of endolymph and perilymph around noise induced lesion sites in the presence of infrasound.

6. Wind turbine noise

Demonstrating an accurate frequency spectrum of the sound generated by wind turbines creates a number of technical problems. One major factor that makes understanding the effects of wind turbine noise on the ear more difficult is the widespread use of A-weighting to document sound levels. A-weighting shapes the measured spectrum according to the sensitivity of human hearing, corresponding to the IHC responses. As we know the sensitivity for many other elements of inner ear related to the OHC do not decline at the steep slope seen for human hearing, then A-weighting considerably underestimates the likely influence of wind turbine noise on the ear. In this respect, it is notable that in none of the physiological studies in the extensive literature reporting cochlear function at low frequencies were the sound stimuli A-weighted. This is because scientists in these fields realize that shaping sound levels according to what the brain perceives is not relevant to understanding peripheral processes in the ear. A-weighting is also performed for technical reasons, because measuring unweighted spectra of wind turbine noise is technically challenging and suitable instrumentation is not widely available. Most common approaches to document noise levels (conventional sound level meters, video cameras, devices using moving coil microphones, etc) are typically insensitive to the infrasound component. Using appropriate instrumentation, Van den Berg showed that wind turbine noise was dominated by infrasound components, with energy increasing between 1000 Hz and 1 Hz (the lowest frequency that was measured) at a rate of approximately 5.5 dB/octave, reaching levels of approximately 90 dB SPL near 1 Hz. Sugimoto et al. (2008) reported a dominant spectral peak at 2 Hz with levels monitored over time reaching up to 100 dB SPL. Jung and Cheung (2008) reported a major peak near 1 Hz at a level of approximately 97 dB SPL. In most studies of wind turbine noise, this high level, low frequency noise is dismissed on the basis that the sound is not perceptible. This fails to take into account the fact that the OHC are stimulated at levels that are not heard.

7. Conclusions

The fact that some inner ear components (such as the OHC) may respond to infrasound at the frequencies and levels generated by wind turbines does not necessarily mean that they will be perceived or disturb function in any way. On the contrary though, if infrasound is affecting cells and structures at levels that cannot be heard this leads to the possibility that wind turbine noise could be influencing function or causing unfamiliar sensations. Long-term stimulation of position-stabilizing or fluid homeostasis systems could result in changes that disturb the individual in some way that remains to be established. We realize that some individuals (such as fighter pilots) can be exposed to far higher levels of infrasound without undue adverse effects. In this review, we have confined our discussion to the possible direct influence of infrasound on the body mediated by receptors or homeostatic processes in the inner ear. This does not exclude the possibility that other receptor systems, elsewhere in the body could contribute to the symptoms of some individuals.

The main points of our analysis can be summarized as follows:

1) Hearing perception, mediated by the inner hair cells of the cochlea, is remarkably insensitive to infrasound.
2) Other sensory cells or structures in the inner ear, such as the outer hair cells, are more sensitive to infrasound than the inner hair cells and can be stimulated by low frequency sounds at levels below those that are heard. The concept that an infrasonic sound that cannot be heard can have no influence on inner ear physiology is incorrect.
3) Under some clinical conditions, such as Meniere's disease, superior canal dehiscence, or even asymptomatic cases of endolymphatic hydrops, individuals may be hypersensitive to infrasound.
4) A-weighting wind turbine sounds underestimates the likely influence of the sound on the ear. A greater effort should be made to document the infrasound component of wind turbine sounds under different conditions.
5) Based on our understanding of how low frequency sound is processed in the ear, and on reports indicating that wind turbine noise causes greater annoyance than other sounds of similar level and affects the quality of life in sensitive individuals, there is an urgent need for more research directly addressing the physiologic consequences of long-term, low level infrasound exposures on humans.

Acknowledgments

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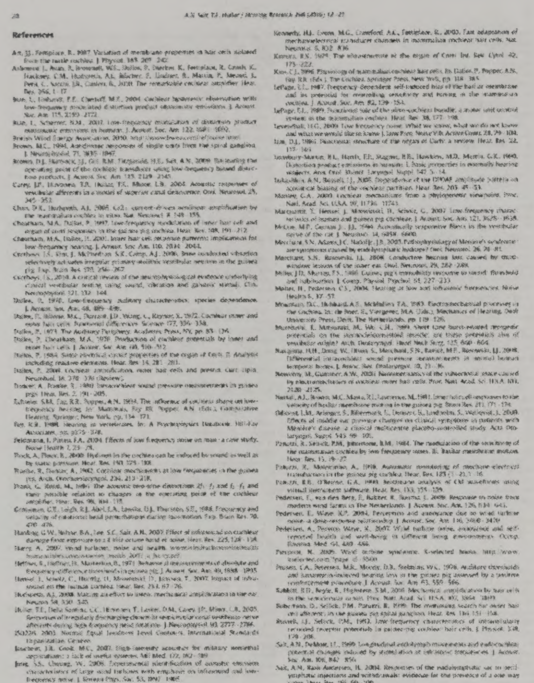

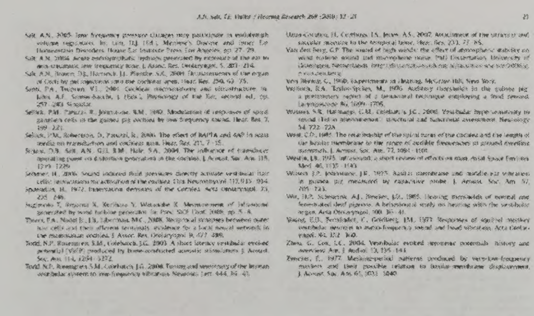

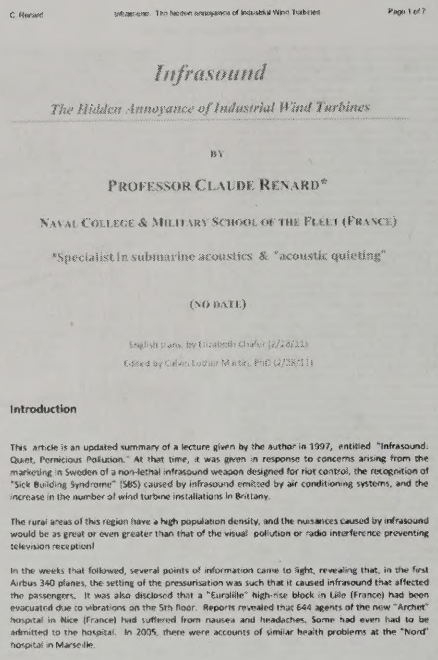

Infrasound

The Hidden Annoyance of Industrial Wind Turbines

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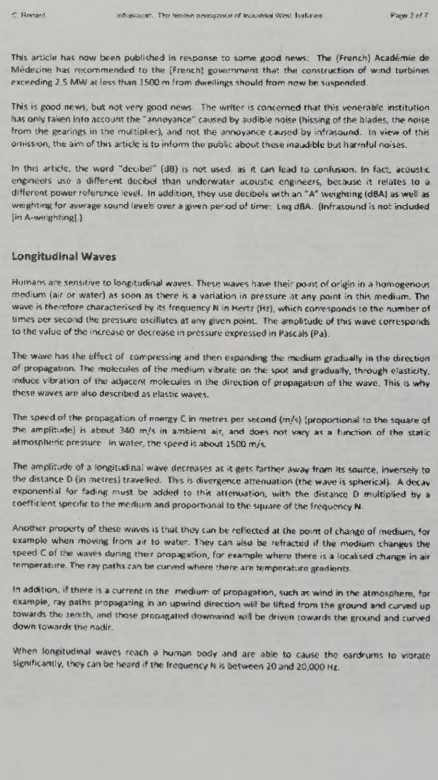
Introduction

This article is an updated summary of a lecture given by the author in 1997, entitled "Infrasound: Quiet, Pernicious Pollution." At that time, it was given in response to concerns arising from the marketing in Sweden of a non-lethal infrasound weapon designed for riot control, the recognition of "Sick Building Syndrome" (SBS) caused by infrasound emitted by air conditioning systems, and the increase in the number of wind turbine installations in Brittany.

The rural areas of this region have a high population density, and the nuisances caused by infrasound would be as great or even greater than that of the visual pollution or radio interference preventing television reception!

In the weeks that followed, several points of information came to light, revealing that, in the first Airbus 340 planes, the setting of the pressurisation was such that it caused infrasound that affected the passengers. It was also disclosed that a "Euralille" high-rise block in Lille (France) had been evacuated due to vibrations on the 5th floor. Reports revealed that 644 agents of the new "Archet" hospital in Nice (France) had suffered from nausea and headaches. Some had even had to be admitted to the hospital. In 2005, there were accounts of similar health problems at the "Nord" hospital in Marseille.



This article has now been published in response to some good news: The (French) Académie de Médecine has recommended to the (French) government that the construction of wind turbines exceeding 2.5 MW at less than 1500 m from dwellings should from now be suspended.

This is good news, but not very good news. The writer is concerned that this venerable institution has only taken into account the "annoyance" caused by audible noise (hissing of the blades, the noise from the gearings in the multiplier), and not the annoyance caused by infrasound. In view of this omission, the aim of this article is to inform the public about these inaudible but harmful noises.

In this article, the word "decibel" (dB) is not used as it can lead to confusion. In fact, acoustic engineers use a different decibel than underwater acoustic engineers, because it relates to a different power reference level. In addition, they use decibels with an "A" weighting (dBA) as well as weighting for average sound levels over a given period of time: Leq dBA. (Infrasound is not included [in A-weighting].)

Longitudinal Waves

Humans are sensitive to longitudinal waves. These waves have their point of origin in a homogenous medium (air or water) as soon as there is a variation in pressure at any point in this medium. The wave is therefore characterised by its frequency N in Hertz (Hz), which corresponds to the number of times per second the pressure oscillates at any given point. The amplitude of this wave corresponds to the value of the increase or decrease in pressure expressed in Pascals (Pa).

The wave has the effect of compressing and then expanding the medium gradually in the direction of propagation. The molecules of the medium vibrate on the spot and gradually, through elasticity, induce vibration of the adjacent molecules in the direction of propagation of the wave. This is why these waves are also described as elastic waves.

The speed of the propagation of energy C in metres per second (m/s) [proportional to the square of the amplitude] is about 340 m/s in ambient air, and does not vary as a function of the static atmospheric pressure. In water, the speed is about 1500 m/s.

The amplitude of a longitudinal wave decreases as it gets farther away from its source, inversely to the distance D (in metres) travelled. This is divergence attenuation (the wave is spherical). A decay exponential for fading must be added to this attenuation, with the distance D multiplied by a coefficient specific to the medium and proportional to the square of the frequency N.

Another property of these waves is that they can be reflected at the point of change of medium, for example when moving from air to water. They can also be refracted if the medium changes the speed C of the waves during their propagation, for example where there is a localised change in air temperature. The ray paths can be curved where there are temperature gradients.

In addition, if there is a current in the medium of propagation, such as wind in the atmosphere, for example, ray paths propagating in an upwind direction will be lifted from the ground and curved up towards the zenith, and those propagated downwind will be driven towards the ground and curved down towards the nadir.

When longitudinal waves reach a human body and are able to cause the eardrums to vibrate significantly, they can be heard if the frequency N is between 20 and 20,000 Hz.

Audible Sound Waves

It follows that audible sound waves are longitudinal waves that have frequencies between 20 Hz and 20 kHz. The human ear starts to perceive them over and above a threshold of hearing. This threshold depends on the frequency of the wave.

The ear is surprisingly sensitive between 1 kHz and 3 kHz, as it can hear sounds of 2 / 100,000ths Pascal, whereas normal atmospheric pressure is 101,500 Pa On the other hand, at 50 Hz the threshold is only 2 / 1,000ths Pascal. The ear is therefore 100 times less sensitive at this frequency.

During a conversation, the sound level is about 1 / 100ths to 2 / 100ths Pascal between 100 Hz and 4 kHz.

In addition, if the amplitude of the sound intensifies, over and above a certain level known as the threshold of pain, people suffer very sharp pain in the head and nausea. If a person stays in this environment, lesions to the cochlea in the ear will appear. This threshold is around 60 Pa.

It is possible to stay in a noisy environment without ear protection for a certain period of time a day without getting lesions, provided the intensity of the sound is lower than the threshold of pain. For example, at 2 Pa, it would be for 2 hours a day, and at 1 Pa for 4 hours a day.

In less noisy environments, people can suffer from noise annoyance which prevents them from sleeping, from thinking, or concentrating on a task, etc. In practice, it is not believed there is annoyance under 5 / 1,000ths Pascal. (This is the field of psychoacoustic studies.)

Just as humans are almost blind, in that they don't see ultraviolet or infrared light, they are also nearly deaf, as they do not hear ultrasounds (N > 20 kHz)—unlike dogs and bats, for example—or infrasound (N < 20 Hz), which is used by certain animals such as elephants and giraffes for communicating.

As we have seen, the attenuation of sounds is proportional to the square of their frequency N. Ultrasounds will not be dealt with in the rest of this article, since they are very quickly absorbed or reflected. However, this is not the case in respect to infrasound, which is also perceived by humans, though in a different way.

The Propagation of Infrasound

An audible wave of 1 kHz will be attenuated 10,000 times more than an infrasonic wave of 10 Hz under the same conditions of emission and reception, and following the same propagation path.
The wave length L in metres (m), being the distance separating two successive peaks during the propagation of a wave, is equal to the ratio of the speed C in m/s to the frequency N in Hz, (L = C / N).

For infrasound having a frequency N of less than 20 Hz, this wavelength is much longer than that of audible sounds, and diffraction by obstacles such as trees and bushes is greatly reduced. The same applies to additional attenuation due to atmospheric turbulence.

For this reason, infrasound propagates over considerable distances and will therefore be affected by slow variations in the physical parameters of the medium. For example, in an adiabatic atmosphere where the temperature drops by 9.8° Celsius for every 1,000 m of altitude, an infrasonic ray emitted

horizontally will curve up towards the zenith and will be capable of going over an obstacle of one metre at a distance of 316 m from its source, or an obstacle 10 m high at a distance of 1,000 m. It could also go over a hill 100 m high situated at a distance of 3.16 km.

Generally speaking, infrasonic rays move upwards until they reach an altitude where they encounter either a temperature gradient which inverts (inversion zone) or a wind gradient. In both instances, as we have already seen, the ray path will curve downwards towards the ground (or the sea), where it can be reflected very easily despite the vegetation (or the waves), and gradually rebound.

In this way, infrasound is guided far away from its source, which explains why, for example, the explosion of Mount St. Helens (USA) on 19th May 1980 was felt all over the world. It is also the way in which elephants are able to communicate with each other over tens of kilometres thanks to the temperature inversion zone that forms from sunset to sunrise.

Knowing that infrasound can be perceived at great intensity even when it is far from the source that produced it, we are now going to look at the perturbations they can cause to humans who cannot hear them.

The Physiological Effects of Infrasound

It was a Frenchman, V. Gavreau, who, during the Sixties, first reported human health problems caused by exposure to infrasound. The symptoms resembled seasickness, accompanied by headache, nausea, and dizziness which led to "deep nervous fatigue." He was also the first to mention eye problems and the impossibility of concentrating on a task.

In the Seventies, a Dane, P.V. Bruel, manufacturer of acoustic metrology equipment, showed that symptoms were felt after only 5 minutes of exposure to infrasound of an amplitude of 1 Pa and a frequency of 12 Hz. He also demonstrated by measurements taken in an estate car travelling at a speed of 100 km/h that the level of infrasound which was almost constantly at 1 Pa between 4 and 16 Hz contributed to "car sickness."

In addition, P.V. Bruel carried out some very interesting measurements of the level of infrasound on the top floor of a sixteen-floor high-rise block when there was a fairly strong wind blowing. The infrasound reached 6 Pa at 1 Hz and dropped to 0.2 Pa at 16 Hz. The signal spectrum showed resonances at 4 Hz (2 Pa), 8 Hz (1 Pa) and 12 Hz (0.4 Pa).

In the USA in 1975, D.L. Johnson defined the threshold levels above which people feel unwell : 0.2 Pa at 20 Hz, 0.6 Pa at 10 Hz, 2 Pa at 5 Hz, 20 Pa at 2 Hz, and 60 Pa at 1 Hz.

In Japan in 1991, H.Takigawa reported that infrasound of 1 Pa between 3 and 7 Hz had an influence on the vestibule of the ear and lead to ocular reflexes (nystagmus), spinal reflexes (tremors), and autonomic reflexes (dyspnoea).

In 1991, the Russian, B. Fraiman, noted the effect of infrasound of 2 Pa on blood pressure, which confirmed the problems of diastolic pressure mentioned in 1974 by Borredon (1 Pa = the pressure of a column of water 10 cm high).

To summarise, infrasound is capable of causing:

- Headaches
- Dizziness
- Nausea
- Nystagmus
- Tremors
- Dyspnoea
- Circulation problems

Sources of Infrasound

Other than infrasound emitted by animals, the sources of infrasound are either natural or manmade. Periodic natural sources are caused by the volcanic eruption, supersonic booms, storms and fractures such as during earthquakes, avalanches and calving of icebergs from glaciers.

Other transient sources are caused by tornadoes (whirlwinds), the flow of wind over natural (mountains) or man-made obstacles (wind turbines, bridges, towers, churches, houses). Oceans and waterfalls are continual natural sources. There are other man-made sources, such as internal combustion engines and ventilation or air conditioning installations.

The remainder of this article deals with sources which are mainly due to noises of turbulent flow of air on obstacles. This causes the formation of Von Karman swirling paths (called Von Karman vortices), which are made up of a series of eddies swirling alternately in one direction and then the other. They emit both audible and inaudible sound, which is either jet sounds for which the frequency N (in Hz) is given by the Krüger and Marsherer formula: N = (0.055), V/E, where V is the wind speed (in m/s) and E the distance (in m) between the two obstacles limiting the jet, or trail sounds on an obstacle having a thickness or diameter E, for which the emission frequency is given by the Strouhal and Krüger formula: N = (0.2), V/E. In the latter case, the eddies are alternately emitted by one edge and then the other of this long obstacle. Depending on the speed of the wind, these phenomena can become audible and cause the whistling emitted by windows that are badly closed, or by electric wires or cables.

The infrasound produced by wind turbines (the tower and the rotor blades) falls under this category. M.L. Legerton's team (*Inter-Noise 96*) showed that, at 100 m from a wind turbine, the infrasound had peaks of 1.4 Pa emitted every 0.65 sec. as the rotor blades passed the wind turbine tower.

Today, the audible sound produced by the blade tips is considerably less, due to improved blade design. The infrasound produced by centrifugal or axial fans is caused by the "flow separation" (pumping) phenomenon. This causes pressure variations which are amplified by the pipe work.

Conclusion

The information given above is enough to understand that it is better not to be exposed to infrasound which propagates far from its point of origin and against which it is impossible to protect oneself due to the long wavelengths.

Those most affected by exposure to infrasound are rural inhabitants living in proximity to wind turbines, and those working in air-conditioned offices.

The people in the former category are exposed to the infrasound 24 hours a day, whereas people in the latter category are only exposed to infrasound 6 hours a day.

The most important issue is therefore to know what intensity of infrasound can be tolerated without inconvenience over these periods of time.

We do not have the answer to this question. During the Seventies, many studies were carried out by army physiologists to find out how long it was possible to stay in a tank where the level of infrasound is in the region of 20 Pa, in the engine room of a ship where there can be levels exceeding 100 Pa at 5 to 20 Hz, and in a space capsule where the level is between 400 and 600 Pa at 1 to 20 Hz. Their problem was in fact to know how long military personnel could carry out their duties under these conditions. The results were kept secret.

In 1976, Von Gierke put forward a limit of 20 Pa between 1 and 20 Hz below which a human being could be exposed for 24 hours without harmful effects. In fact, those who live near waterfalls or by the sea, where levels of infrasound can vary from 1 to several Pascals, can confirm this.

It would seem that infrasonic noise that does not contain particular frequencies (white noise) is easier to tolerate. It is therefore better to concentrate attention on the power spectral density expressed in Pascals squared per Hertz. In 1993, B.J. Fraimann measured on the Pacific coast a power density G varying 1/N with the frequency signature of the atmospheric turbulence.

It is clear that there is wide scope for further research, which we would like the appropriate government ministries to initiate. In addition, research on the effects of infrasound on animals needs to be carried out.

In the meantime, the application of the Precautionary Principle would be appropriate, in particular with respect to the decision to install wind turbines.

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Evaluating the impact of wind turbine noise on health-related quality of life

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Abstract

We report a cross-sectional study comparing the health-related quality of life (HRQOL) of individuals residing in the proximity of a wind farm to those residing in a demographically matched area sufficiently displaced from wind turbines. The study employed a nonequivalent comparison group posttest-only design. Self-administerrd questionnaires, which included the brief version of the World Health Organization quality of life scale, were delivered to residents in two adjacent areas in semirural New Zealand. Participants were also asked to identify annoying noises, indicate their degree of noise sensitivity, and rate amenity. Statistically significant differences were noted in some HRQOL domain scores, with residents living within 2 km of a turbine installation reporting lower overall quality of life, physical quality of life, and environmental quality of life. Those exposed to turbine noise also reported significantly lower sleep quality, and rated their environment as less restful. Our data suggest that wind farm noise can negatively impact facets of HRQOL.

Keywords: Amenity, annoyance, health-related quality of life, sleep quality, wind turbine noise

Introduction

Wind turbines transform wind energy into electricity, a practice dating back over 100 years. However, in the last decade industrial-scale harvesting of wind energy has increased, driven by a desire to generate sustainable energy and to lessen the impact of fossil fuel depletion. Whether located in isolation or as components of a "wind farm", wind turbines were initially welcomed by many communities due to their environmental credentials, though reference to the mainstream media shows that public opposition to wind turbines has increased substantially in the past few years.[1] Complaints against established wind farms, or concern elicited by proposed wind farms, focus on the noise they produce, or the visual impact they have on the environment.

The desire to maximize electricity production while minimizing transmission costs means that in many countries wind farms have been constructed in semirural areas (also known as "greenbelt" or "life-style" areas) close to major towns and cities. Noise from wind farms located in semirural areas is of interest because it is typically a low amplitude noise impeding on a well-characterized and generally cherished soundscape. Consequently, there has been considerable debate over whether wind farm noise poses a significant health threat to those living in their vicinity. It has been suggested that wind turbines can directly impact health via the emission of low-frequency sound energy (i.e., infrasound below 20 Hz), though this is currently an area of controversy.[2,3] Additionally, wind turbines may compromise health by producing sound that is annoying and/or can disturb sleep. In this respect, it can be classified as community noise along side industrial or transportation noise. When built in semirural settings, the visual impact of wind farms can also degrade amenity and interact with wind turbine noise to exacerbate annoyance reactions,[4] possibly due to a violation of the landscape–soundscape continuum constructed by those who choose to live in these areas.[5]

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Figure 1 represents a simple model informed by the literature[6-8] demonstrating that, in the semirural context, there are feasible mechanisms by which wind turbine exposure can degrade health and well-being. Turbine noise can lead directly to annoyance and sleep disturbance (primary health effects), or can induce annoyance by degrading amenity. Additionally, the trait of noise sensitivity, which describes individuals who are more likely to pay attention to sound, evaluate sound negatively, and have stronger emotional reactions to noise,[9] constitutes a major risk factor. The secondary health effects would be immediate reductions in

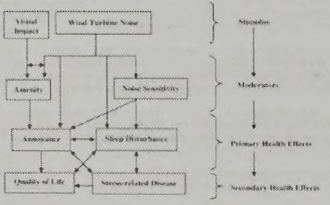


Figure 1: A schematic representation of the relationship between wind turbines and health in a semirural setting. The multiplicity of relationships emerges due to variability in the response of individuals to noise

general well-being, with stress-related disease emerging from chronic annoyance and sleep disturbance. Irrespective of source, chronic noise exposure is a psychosocial stressor that can induce maladaptive psychological responses and negatively impact health via interactions between the autonomic nervous system, the neuroendocrine system, and the immune system.[7] A chronic stress response will, in turn, degrade quality of life [Figure 1].

Quantifying the impact of wind turbines on individual health will inform wind turbine operational guidelines, and in this respect constitutes an important process that is currently not far advanced. A variety of outcome measures have been proposed to assess the impacts of community noise, including annoyance, sleep disturbance, cardiovascular disease, and cortisol levels.[8] An alternative approach to health assessment involves the subjective appraisal of health-related quality of life (HRQOL), a concept that measures general well-being and well-being in the physical, psychological, and social domains. Because changes in HRQOL are expected to closely co-vary with changes in health, the WHO recommends the use of HRQOL measures as an outcome variable, arguing that the effects of noise are strongest for those outcomes classified under HRQOL rather than illness.[9] HRQOL is related to health by the WHO (1948) definition of health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity," and can be considered as an operationalization of the well-being concept.[10]

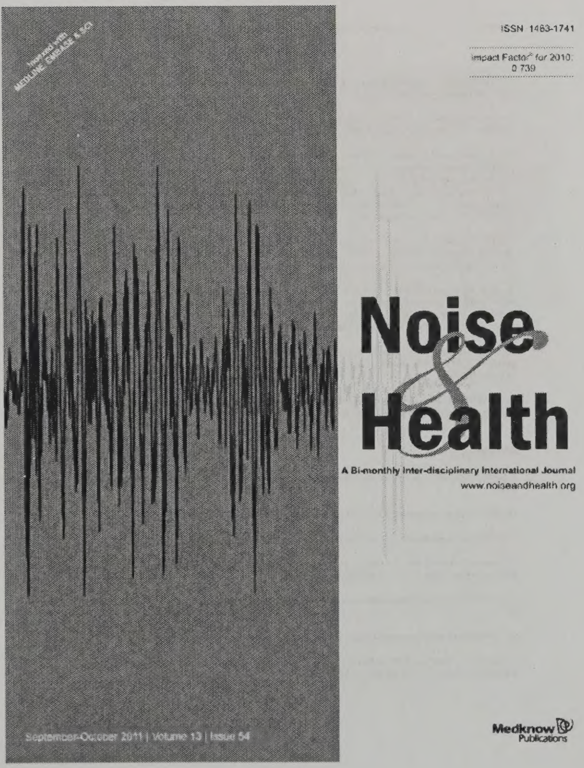
There is scientific evidence linking community noise to health problems.[7,9] The WHO reports that chronic noise-induced annoyance and sleep disturbance can compromise health and HRQOL.[9,11] However, there has been little research examining the relationship between noise and HRQOL. An exception is Dratva *et al.*,[12] who, using the Short Form (SF36) health survey, reported an inverse relationship between annoyance from traffic noise and HRQOL. They argued that HRQOL would be expected to co-vary more with annoyance than with noise level as level is generally a poor predictor of the human response to noise, and its role in health is commonly overemphasized. As alternatives to noise level, other factors associated with the listener should be considered,[5] including the perceived control a person has over the noise, as well as their attitudes, personality, and age (all of which could be added to Figure 1 as moderators).

This exploratory study examines the association between HRQOL and proximity to an industrial wind farm in a semirural area, adding to the small number of peer-reviewed studies into the health impacts of wind turbines that are only beginning to appear in the literature. Case studies supported by qualitative analyses[13,14] suggest a negative relationship between wind turbine noise and well-being. There have been no previous quantitative investigations of the impact of wind farms on HRQOL, though correlations have been observed between wind turbine noise, annoyance, and sleep disruption.[15,16] Given these findings, and with reference to Figure 1, it would be expected that both mean amenity and sleep satisfaction scores would be lower in individuals residing around turbines, and that the proportion of individuals annoyed by noise would be greater for those exposed to turbines than those not. Additionally, lowered amenity and greater annoyance should result in lower mean HRQOL domains in those residing close to wind turbines.

Materials and Methods

Design

A nonequivalent comparison group posttest-only study



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design was utilized. Strict socioeconomic matching was undertaken using the New Zealand Deprivation Index 2006, as described elsewhere. Both areas are classified as semirural, with a population density of less than 15 people per square kilometer.

Sample

Samples were drawn from two demographically matched areas differing only in their distances from a wind farm in the Makara Valley, a coastal area 10 km west of New Zealand's capital city, Wellington. The Makara Valley is characterized by hilly terrain, with long ridges running 250-430 m above sea level, on which 66 125 m high wind turbines are positioned as part of the "West Winds" project. Figure 2 is a map showing the positions of a subset of wind turbines relative to some of the houses in valley. The first sample (the *Turbine* group) was drawn from residents in the South Makara Valley who resided in 56 houses located within 2 km of a wind turbine. A comprehensive noise survey of the area was undertaken independently, indicating intrusive elements of the turbine noise such as the "rumble-thump." The Makara turbines, operational since May 2009, have measured levels that are consistent with levels reported in European studies, in which typical noise exposures from wind turbines ranged from between 24 dB(A) and 54 dB(A). Long-term measurements undertaken by the wind farm developers at various residences show that while average outdoor levels ($L_{95(10\,min)}$ dB(A)) are largely compliant with consent conditions, they still range between 20 dB(A) and 50 dB(A) depending on meteorological conditions. The second sample (the *Comparison* group) was taken from residents in 250 houses in a geographically and socioeconomically matched area, but which were located at least 8 km from any wind farm in the region.

Questionnaire

The coversheet of the questionnaire bore the title *2010 Well-being and Neighbourhood Survey*, designed to mask the true intent of the study. Each house received two copies of the questionnaire. Potential participants were invited to participate in the research investigating their place of living and their well-being if they resided at the address to which the questionnaire had been delivered and if they were 18 years or older. The order of the questions was a prime consideration: HRQOL (26 items), amenity (2 items), neighbourhood problems (14 items), annoyance (7 items), demographic information (7 items), and a single item probing noise sensitivity. All scale items were presented on a numbered five-point scale with appropriate descriptors anchoring the terminals. Self-reported HRQOL was measured using the abbreviated version of the WHOQOL-BREF which affords composite measures of physical (7 items), psychological (6 items), and social (3 items) HRQOL. Additionally, the WHOQOL-BREF has two generic items asking about general health and overall quality of life, and an additional domain measuring and

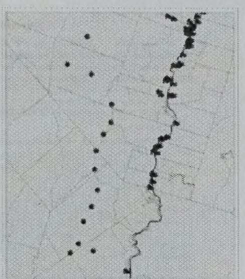

Figure 2: Map showing a part of the Makara Valley and the relative distances between houses and 14 of the 66 turbines. The wind turbines (Siemens SWT-2.3-82 VS) have 68 m high towers and rotor diameters of 82 m (Map generated by Rachel Summers, and displayed with permission).

environmental QOL (8 items). The two amenity items were: "I am satisfied with my neighbourhood/living environment" and "My neighbourhood/living environment makes it difficult for me to relax at home." A modified neighbourhood problem scale consisted of 14 distracter items that were not relevant to the current study and were not included in the analysis. Seven items on annoyance were included, four distracter items asking about air quality, and three items probing annoyance to traffic, other neighbours, or other noise (*please specify*). Additionally, participants were asked if they were not noise sensitive, moderately noise sensitive, or very noise sensitive. The questionnaire terminated with an open-ended item asking "If you would like to share any comments relating to your neighbourhood or this survey then please do so in the box below." Participants were asked to respond to all items and to return surveys by post in the prepaid envelopes provided.

Demographics

Self-reported age and sex measures were obtained and self-reported level of educational status used as a further indicator of socioeconomic status. Additionally, participants were asked what their current employment status was, and whether they were currently ill or had a medical condition.

Participants were also asked how long they had lived at their current residence.

Statistical analysis

Analysis commenced after an evaluation of each scale's psychometric properties, including inspection for floor and ceiling effects and tests of internal consistency (Cronbach's alpha) and to validate dimensionality (corrected item-total correlations). Differences in HRQOL and amenity between

Table 1: Demographic profile of the turbine and comparison groups

Variables	Turbine group (n=39) n (%)	Comparison group (n=158) n* (%)
Sex		
Male	16 (41)	65 (41)
Female	23 (59)	93 (58)
Age group, years		
18-20	1 (2.6)	2 (1.3)
21-30	1 (2.6)	1 (0.6)
31-40	3 (7.7)	22 (13.9)
41-50	10 (25.6)	53 (33.5)
51-60	11 (28.2)	44 (27.8)
61-70	7 (17.9)	27 (17.1)
71+	3 (7.7)	9 (5.6)
Education (completed)		
High school	11 (28.2)	55 (34.8)
Polytechnic	11 (28.2)	48 (30.3)
University	17 (43.6)	54 (34.2)
Employment status		
Full time	21 (53.8)	83 (52.5)
Part time	0 (0)	3 (1.8)
Unpaid work	1 (2.6)	3 (1.8)
Unemployed	6 (15.4)	27 (17.1)
Retired	10 (25.6)	40 (25.3)
Noise sensitivity		
None	13 (33.3)	60 (37.9)
Moderate	21 (53.8)	76 (48.1)
Severe	5 (12.8)	20 (12.7)
Chronic illness		
Yes	12 (31)	50 (31.6)
No	27 (69.2)	104 (65.8)

*Totals may differ due to missing data

the turbine and comparison groups were calculated using univariate analysis of covariance (ANCOVA), with length of residence selected *a priori* as a covariate. All testing was undertaken in accordance with Tabachnick and Fidell's guidelines for testing between groups with unequal sample sizes, and Bonferroni corrections were applied where appropriate. Because of the unequal sizes between the two groups the assumptions of normality and homogeneity of variance were assessed carefully. Five cases were excluded from the comparison group because they were multivariate outliers as defined by extreme Mahalanobis distances, with response set acquiescence clearly evident in all five cases.

Results

The response rates, 34% and 32% from the turbine and comparison groups, respectively, are typical for this type of research (e.g., van den Berg and colleagues report a 37% response rate). Table 1 presents demographic information for the comparison and turbine groups. Prior to analyses the data were screened to identify potential confounds. The proportions of males and females in each area were equivalent ($\chi^2(1)$ = 0.001, P = 0.967), while a Mann–Whitney U indicated no age difference between the two areas ($U(n_1 = 158, n_2 = 39)$ = 1022.5, P = 0.802). Education ($\chi^2(2)$ = 2.474, P = 0.291), noise sensitivity ($\chi^2(2)$ = 0.553, P = 0.758), and self-reported illness ($\chi^2(1)$ = 0.414, P = 0.562) were not associated with area.

Table 2 displays correlation coefficients (Pearson's r) between noise-related and health-related variables for both groups. Of remark is the negative correlation between annoyance and self-rated health for both groups, and a different pattern of correlations between noise sensitivity and annoyance across the two groups. Separate ANCOVA's revealed differences and similarities between the two areas in terms of HRQOL [Table 3]. Firstly, the turbine group reported a lower ($F(1,194)$ = 5.816, P = 0.017) mean physical HRQOL domain score than the comparison group. Scrutiny of the seven facets of the physical domain showed a difference in perceived sleep quality between the two areas ($t(195)$ = 3.089, P = 0.006),

Table 2: Pearson product-moment correlation coefficients (r) for noise-related and HRQOL variables. Statistics to the right of the major diagonal are for the comparison group, while those to the left are for the turbine group

	Sensitivity	Annoyance	Sleep	Health	Health-related quality of life				
					Physical	Psychological	Social	Environment	Overall
Sensitivity	1	0.134	-0.017	0.082	-0.017	0.069	0.046	0.066	-0.109
Annoyance	0.440**	1	0.042	-0.238**	-0.208*	-0.135	-0.155*	-0.319**	-0.092
Sleep	0.433**	-0.147	1	0.237**	0.378**	0.469**	0.327**	0.270**	0.398*
Health	-0.224	-0.308	0.471**	1	0.706**	0.493**	0.155*	0.264**	0.422**
Physicalᵃ	-0.24	-0.212	0.364*	0.524**	1	0.653**	0.294*	0.455**	0.475**
Psychological	-0.404*	-0.113	0.473**	0.329*	0.268	1	0.55**	0.668**	0.580**
Social	-0.359*	-0.236	0.116	-0.021	0.036	0.212	1	0.450**	0.457**
Environment	-0.233	0.028	0.404**	0.2	0.473*	0.468*	-0.17	1	0.546**
Overall	-0.203	0.16	0.471**	0.289	0.282	0.286	0.162	0.380*	1

*P < 0.05, **P < 0.001. ᵃItem 16 (satisfaction with sleep) was removed from the Physical HRQOL domain to avoid confound with sleep satisfaction

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Table 3: Mean (M) and standard deviation (SD) statistics for the four HRQOL domains of the WHOQOL-BREF and amenity total scores, presented for both the comparison group and the turbine group

Measure	Turbine group		Comparison group	
	M	SD	M	SD
Physical	27.38	3.14	29.14	3.89
Psychological	21.36	2.67	21.29	2.91
Social	12.53	1.83	12.54	2.13
Environmental	29.92	3.76	32.76	4.41
Amenity	7.46	1.42	8.91	2.64

and between self-reported energy levels ($t(195)$ = 2.217, P = 0.028). Secondly, the turbine group had lower ($F(1,194)$ = 5.694, P = 0.018) environmental QOL scores than the comparison group. This domain is the sum of eight items, and further analysis of these revealed that the turbine group considered their environment to be less healthy ($t(195)$ = 3.272, P < 0.007) and were less satisfied with the conditions of their living space ($t(195)$ = 2.176, P = 0.031). Thirdly, there were no statistical differences in social ($F(1,194)$ = 0.002, P = 0.963) or psychological ($F(1,194)$ = 3.334, P = 0.069) HRQOL, although the latter was marginal and the mean for the turbine group was lower. Of the two generic WHOQOL-BREF items, the mean of the self-rated general health item was equivalent between turbine and comparison groups ($t(195)$ = 0.374, P = 0.709), while the mean ratings for an overall quality of life item was lower ($t(195)$ = 2.364, P = 0.019) in the turbine group.

The turbine group reported lower amenity than the comparison group ($F(1,194)$ = 18.88, P < 0.001). There were no differences between groups for traffic ($t(195)$ = 0.568, P = 0.354) or neighborhood ($t(195)$ = 1.458, P = 0.144) noise annoyance. A comparison between ratings of turbine noise was not possible, but the mean annoyance rating for turbine group individuals who specifically identified wind turbine noise as annoying (n=23) was 4.59 (SD = 0.65), indicating that the turbine noise was perceived as extremely annoying. For the comparison group, seven "other" annoying noises were identified: barking dogs (x2), farm machinery (x2), and racing cars (x3).

Discussion

Our results link exposure to wind turbines to degraded HRQOL, a finding that is consistent with the model described in Figure 1. Specifically, those residing in the immediate vicinity of a wind farm scored worse than a matched comparison group in terms of physical HRQOL and environmental QOL, and HRQOL in general. No differences were found in terms of psychological and social HRQOL, or in self-rated health. The high incidence of annoyance from turbine noise in the turbine group is consistent with the theory that exposure to wind turbine noise is the cause of these differences. Importantly, we also found a reduction in sleep satisfaction ratings, suggesting that both annoyance and sleep disruption may mediate the relationship between noise and HRQOL. These findings are consistent with those reported in relation to aviation noise and traffic noise.

Of further interest are the likely mechanisms involved in the degradation of HRQOL when exposed to turbine noise. Studies show that the level of turbine noise is a poor predictor of human response, and dose-response relationships typically explain little of the association between turbine noise and annoyance. Pedersen *et al.* and van den Berg *et al.* show that, for equivalent noise levels, people judge wind turbine noise to be of greater annoyance than aircraft, road traffic, or railway noise. This may be due to the unique characteristics of turbine noise, that is, clusters of turbines present a cumulative effect characterized by a dynamic or modulating sound as turbines synchronise. The characteristic swishing or thumping noise associated with larger turbines is audible over long distances, up to 5 km and beyond in some reports.

van den Berg showed that sound is the most annoying aspect of wind turbines, and is more of a problem at night. A large proportion (23/39) of respondents from the turbine group identified turbine noise as a problem and rated it to be extremely annoying. It should be noted that, in contemporary medicine, annoyance exists as a precise technical term describing a mental state characterized by distress and aversion, which if maintained, can lead to a deterioration of health and well-being. A Swedish study reported that, for respondents who were annoyed by wind turbine noise, feelings of resignation, violation, strain, and fatigue were statistically greater than for respondents not annoyed by turbine noise. An attempt at constructing dose-response relationships between turbine noise level and annoyance in a European sample suggests that at calculated noise levels of 30-35 dB(A), 10% of the sample was rather or very annoyed at wind turbine sound, increasing to 20% at 35-40 dB(A) and 25% at 40-43 dB(A).

We also observed lower sleep satisfaction in the turbine group than in the comparison group, a finding which is consistent with previous research. One study directly related to wind turbine noise reported that 16% of respondents experiencing 35 dB(A) or more of noise suffered sleep disturbances due to turbine noise. Another study investigating the effects of wind turbine noise on sleep showed that 36% of respondents who were annoyed at wind turbine noise also reported that they suffered disturbed sleep (versus 9% of those not annoyed). A case-study approach examining exposure to turbine noise likewise identified turbine noise as an agent of sleep disturbance. In relation to turbine noise levels, one study reported that even at the lowest noise levels (<25 dB(A)), 20% of respondents reported disturbed sleep at least one night per month, and that interrupted sleep and difficulty in returning to sleep increased with calculated noise

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level. Demonstrably, our data have also captured the effects of wind turbine noise on sleep, reinforcing previous studies suggesting that the acoustic characteristics of turbine noise are well suited to disturb the sleep of exposed individuals.

While strong correlations exist between the sound level and the perceived loudness of a sound, there is no clear relationship between level and the psychological responses that individuals have to a sound. Noise sensitivity is one psychological factor that is increasingly being related to noise annoyance in literature. We found that, for the turbine group, noise sensitivity is a strong predictor of noise annoyance and is correlated with facets of HRQOL, supporting other studies suggesting that annoyance mediates the relationship between noise sensitivity and HRQOL. Other studies show that noise sensitivity has a large impact on noise annoyance ratings, lowering annoyance thresholds by up to 10 dB. The lack of statistical significance in the comparison group may indicate that, in the absence of annoying noise, the impact of noise sensitivity on HRQOL may be underestimated.

Another finding emerging from our data is that living close to wind turbines is associated with degraded amenity. This is consistent with previous research showing that wind turbine noise was judged incongruent with the natural soundscape of the area. Amenity values are based upon what people feel about an area, its pleasantness, or some other value that makes it a desirable place to live. There is an expectation of "peace and quiet" when living in a rural area, and most choose to live in rural areas for this reason. Furthermore, those who live in rural areas have different expectations about community noise than those living elsewhere. Other studies report that wind turbines are viewed as eyesores and visual spoilers of the environment, and from an aesthetic perspective, those who view the wind turbines as ugly are likely to disassociate them from the landscape and react more strongly to turbine noise. The measurement of the perceived visual impact of the wind farm was beyond the scope of the current study, specifically due to the masking of the study's intent. Scrutiny of the comments provided by the turbine group, however, revealed no mention of the impact of turbines on the landscape, reinforcing suggestions made by others that wind farm noise is more dominant than their visual aspects.

Strengths and limitations

A strength of this study is the masking of the primary intent of the questionnaire by giving the impression that general neighborhood factors (e.g., street lighting, rubbish collection), and not wind turbine exposure, constituted the study's core aims. Concealing the study's objectives should reduce response bias, and our placing of the HRQOL items at the beginning of the survey, well before the three items probing noise annoyance, would serve to elicit subjective ratings of HRQOL without first being primed with potentially upsetting noise items. A further strength is the use of a nationally validated inventory that adopts a multidimensional approach to HRQOL.

The main limitation of the study, partly forced by our desire to conceal the aim of the survey, was that coincident noise measurements were not obtained. While independent estimates of wind farm noise in the Makara Valley have been reported, it would have been desirable to undertake measurements in both the turbine and the control areas. That said, on the basis of the very few noise complaints made by those in the control areas (as described in the Results section), we are confident that the control areas provide typical semirural soundscapes that are not encroached by intrusive noise. An additional limitation of the study is the sample size of the turbine group. While the response rate compares favorably to other wind turbine research reported in the literature, the sparsely populated locales surrounding wind farms in rural New Zealand presents a recruitment challenge. A larger sample of residents exposed to wind turbines would have afforded more analytical options. However, that the effects were found with such a modest sample size may be indicative of genuine differences between the two groups.

Any future adoption of the model presented in Figure 1 should increase the number of moderators, and include factors such as attitudes to the noise source and individual coping strategies. For example, the conflict between the Makara community and the wind farm developers could also potentially reduce HRQOL or amplify annoyance reactions and sleep difficulties. A telephone complaint line, set up by the wind farm developer as a condition of consent, attracted over 1000 noise complaints in the first year. Such conflict would induce stress and emotional reactions that would be expected to degrade psychological HRQOL, though this was not found to be different from the control group. An explanation of this null result on the psychological domain may be derived from the open-ended comments from the control group, which reveal that they themselves are in conflict with local governance bodies attempting to increase residential dwellings in the area.

Conclusion

A thorough investigation of wind turbine noise and its effects on health is important given the prevalence of exposed individuals, a nontrivial number that is increasing with the popularity of wind energy. For example, in the Netherlands it is reported that 440,000 inhabitants (2.5% of the population) are exposed to significant levels of wind turbine noise. Additionally, policy makers are demanding more information on the possible link between wind turbines and health in order to inform setback distances. Our results suggest that utility-scale wind energy generation is not without adverse health impacts on nearby residents. Thus, nations undertaking large-scale deployment of wind turbines need to consider the impact of noise on the HRQOL of exposed individuals. Along with others,[1-8] we conclude that night-time wind turbine noise limits should be set conservatively to minimize harm, and, on the basis of our data, suggest that setback distances need to be greater than 2 km in hilly terrain.

Acknowledgments

We are grateful to our colleagues and others whose reviews substantially improved the manuscript. We are especially grateful for the thorough review undertaken by Professor Rex Billington, who as the WHO Director of Mental Health in the 1990s oversaw the development of the WHO's program into quality of life, health and the environment.

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2. AIM

A pilot study was carried out to assess methods evaluating effects of low frequency noise on performance. Of special interest was to study objective and subjective effects on performance involving cognitive aspects over time.

3. METHODS

3.1. EXPOSURE NOISES

The exposure noises were two ventilation noises, one of a predominantly mid frequency character (mid frequency noise) and the other was of a predominantly low frequency character (low frequency noise). The mid frequency noise was recorded from a ventilation installation. To obtain the low frequency noise, sound pressure levels in the frequency region of 31·5 to 125 Hz were added to the ventilation noise by a digitalized sound processor system (Aladdin interactive workbench). A tone at 31·5 Hz was amplitude-modulated with an amplitude frequency of 2 Hz. The low frequency noise was perceived as indistinguishable from rumbly ventilation noise. The sound pressure levels of the frequency spectra in octave bands for the two sounds closely followed the NC 35 curve. The dB(A) value was 41 dB(A) for the mid frequency noise and 42 dB(A) for the low frequency noise. The third octave band sound pressure levels of the two noises are shown in Figure 1. Figure 2 shows the octave band sound pressure levels related to the noise criterion of NC 15–NC 45.

3.2. TEST SUBJECTS

For the study, 50 students were recruited by advertising. They were exposed to a low frequency noise, and the 30 who reported a feeling of pressure over the eardrum were included in the study. Of these, 14 randomly selected healthy subjects with an average age of 25 years (21–34) took part.

3.3. TEST CHAMBER

The experiment was performed in a test chamber (24 m^3) furnished as an office environment. The background noise from the normal ventilation was less than 22 dB(A), and the sound pressure levels were below the threshold of normal hearing for the frequencies region below 160 Hz [3]. The noise was emitted from four loudspeakers placed in each

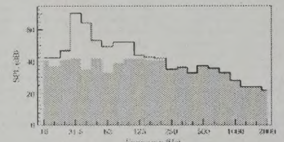

Figure 1. The equivalent third octave band sound pressure levels of the two exposure noises. The low frequency noise is marked with an unbroken line and the shaded area represents the mid frequency noise.

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EFFECTS ON PERFORMANCE AND WORK QUALITY DUE TO LOW FREQUENCY VENTILATION NOISE

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A pilot study was carried out to assess method evaluating effects of low frequency noise on performance. Of special interest was to study objective and subjective effects over time. Two ventilation noises were used, one of a predominantly mid frequency character and the other of a predominantly low frequency character. Both had an NC value of 35. For the study, 50 students were recruited and 30 selected on the basis of subjective reports of pressure on the eardrum after exposure to a low frequency noise. Of these, 14 randomly selected subjects aged 21 to 34 took part. The subjects performed three computerized cognitive tests in the mid frequency or the low frequency noise condition alternatively. Tests I and II were performed together with a secondary task.

Questionnaires were used to evaluate subjective symptoms, effects on mood and estimated interference with the test results due to temperature, light and noise. The results showed that the subjective estimations of noise interference with performance were higher for the low frequency noise ($p < 0.05$). The exposure to low frequency noise resulted in lower social orientation ($p < 0.05$) (more disagreeable, less co-operative, helpful) and a tendency to lower pleasantness ($p = 0.07$) (more bothered, less content) as compared to the mid frequency noise exposure. Data from test III may indicate that the response time during the last part of the test was longer in the low frequency noise exposure. The effects seemed to appear over time. The hypothesis that cognitive demands are less well coped with under the low frequency noise condition, needs to be further studied. The results further indicate that the NC curves do not fully assess the negative effects of low frequency noise on work performance.

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1. BACKGROUND

In occupational environments such as control rooms and office-like areas, there is growing concern as to the effects of low frequency noise (20–200 Hz). Low frequency noise may be emitted from ventilation, heating and air-conditioning (HVAC) systems or may occur as a result of the selective attenuation of walls, floor etc. A few previous studies indicate that low frequency noise may reduce performance at levels that can occur in such occupational environments [1, 2]. Some of the symptoms that are related to exposure to low frequency noise such as mental tiredness, lack of concentration and headache related symptoms, could be associated with a reduced performance and work satisfaction.

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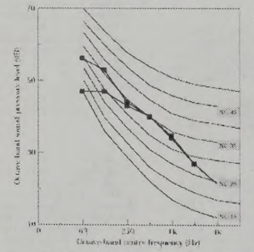


Figure 2. The equivalent octave band sound pressure levels of the two exposure noises in relation to the noise criterion curves of NC 15–NC 45.

corner of the room and hidden behind curtains and thus presenting no obvious visual distraction.

3.4. PERFORMANCE TESTS

The subjects performed three computerized cognitive tests. Test I was a rotation figure test. Two figures were presented on the screen and the object of the test was to identify as quickly as possible whether the left figure was rotated or inverted in relation to the right figure. The response time and correct/false number of answers were recorded. Test II was a short term memory test. On the screen, a set of numbers e.g., 1586, was presented. This was followed by one number, e.g., 5. The subjects was to respond to whether the number (5) was among the set of numbers (1586) presented directly before. The response time and correct/false number of answers were recorded. Test III was a verbal reasoning test developed by Baddeley [4]. It was translated into Swedish and added to the computerized Swedish performance evaluation system (SPES) [5]. The test is based on grammatical transformation of sentences that are varied in passive, active, negative and positive structures. The subject is requested to respond to whether the sentences are false or true in relation to a letter combination following the sentences. For example:

		True	False
A is not followed by B	BA	✓	
B precedes A	AB		✓

In total, the test included six blocks of 32 different sentences. Response time and correct/false answers were recorded.

Tests I and II were performed together with a secondary task which consisted of a set of four lamps placed in four different positions on an arch in the periphery of the subject's visual field. Each of the four lamps was lit up at random intervals and in random sequence. The subjects were to respond to only one of the four coloured lamps (the yellow lamp) by pushing the button with the colour that corresponded to the lamp that was lit at a random interval before the yellow lamp. The secondary test created an interactive environment which led to a competition of cognitive resources, simulating a basic demand in most working situations.

3.5. DESIGN

The first session was always a learning session performed in background mid frequency ventilation noise (< NC 30). The following two sessions were performed alternatively in the mid frequency noise or the low frequency noise, both at a level of NC 35. The sessions took place in the afternoons of separate days. The total length of the test session was 60 minutes. Before and after the test session, the subjects answered a questionnaire evaluating mood [6]. After the session, a questionnaire was answered evaluating subjective symptoms that had earlier been found to be associated with low frequency noise exposure, such as headache, a feeling of pressure on the head, fatigue, irritation, a feeling of pressure on the eardrum, nausea, dizziness and concentration difficulties. Also included were symptoms that were not associated with low frequency noise exposure, such as eye irritation, throat irritation and a sensation of unpleasant taste. Finally, a question was posed on estimated interference with the test results caused by temperature, light and noise and estimated annoyance due to noise.

3.6. STATISTICAL ANALYSIS

The subjective ratings and the difference in mood before and after the exposures were analysed using Student's test two sided, for dependent data. Relationships between subjective and objective data were analyzed using Pearson's correlations coefficient. p-values below 0·05 were considered statistically significant.

4. RESULTS

Figure 3 shows the average value of subjective ratings of interference with performance caused by the different noise exposures. The Figure also includes the response to the mid frequency ventilation noise of < 30 NC which was present during the learning session (N).

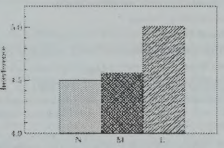


Figure 3. The average value of the estimated interference with performance in relation to the learning session (N), the mid (M) and the low (L) frequency exposure noises.

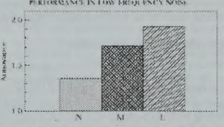


Figure 4. The average value of estimated annoyance for the different noise exposures. Key as Figure 3.

The value of 4 refers to "no interference" and the value of 5 refers to "performance somewhat decreased". It can be seen in Figure 3 that the average estimation of noise interference with performance was higher for the low frequency noise condition ($p < 0·05$) as compared to the mid frequency noise condition.

The average value of estimated annoyance is shown in Figure 4. The value of 1 referred to "not at all annoying" and the value 2 referred to "somewhat annoying". It can be seen in Figure 4 that estimated annoyance followed the pattern displayed in Figure 3. However, the difference in annoyance between the low frequency noise and the mid frequency noise was not statistically significant ($p = 0·19$).

Reported symptoms were generally low. There was a tendency towards higher reports of a feeling of pressure on the eardrum after the low frequency noise exposure ($p = 0·089$), which was in accordance with what was expected owing to the selection criteria of the subjects. It can also be noted that the subjects reported a feeling of pressure on the head rather than headache after the low frequency noise exposure. The difference between the low and mid frequency noises was however not significant ($p = 0·18$).

Figures 5 and 6 show the average value of social orientation and pleasantness before and after the exposures for the low frequency noise and the mid frequency noise. A lower social orientation ($p < 0·05$) (subjects felt more disagreeable, irritated, ill-tempered, less co-operative, helpful) and a tendency to lower pleasantness ($p = 0·07$) (subjects felt more bothered, depressed, less content) were found after the exposure to the low frequency noise as compared to the before and after scores for the mid frequency noise exposure. The average values of the response time for the six different time periods in test III for the two exposure noises are shown in Table 1. It can be observed from Table 1 that the response time showed a tendency towards a decrease for the mid frequency noise, while this is not seen for the low frequency noise. Also of interest is the standard deviation, which decreased over time for the mid frequency noise and increased over time for the low frequency noise.

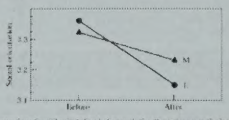


Figure 5. The average value of social orientation before and after the exposure to the low frequency noise (L) and the mid frequency noise (M).

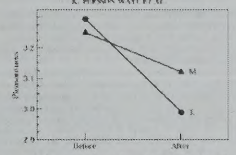


Figure 6. The average value of pleasantness before and after the exposures. Key as Figure 5.

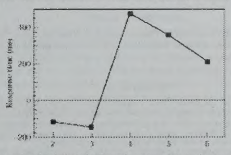


Figure 7. The average value of the individual difference in response times for the two ventilation noises. The x-axis shows equal blocks of the verbal test.

Owing to the variance and the small number of subjects, a statistical analysis was not meaningful at this stage. To investigate the tendency seen in Table 1 more closely, an analysis was made of the difference between each individual's response time for the two noises. The average values of these differences are shown in Figure 7. The x-axis in the figure shows blocks of equal numbers of sentences, with the first block excluded. The x-axis can thus be seen as a time scale, and the test subjects took an average about four minutes to answer each block. Figure 7 may indicate that the response time for the low frequency noise was longer during the last three time periods. If there had been no difference in response time between the noises the average value would have been zero.

TABLE 1

The average values of the response time and standard deviation for the six time periods in test III for the mid frequency noise (M) and the low frequency noise (L)

Noise time period	M		L	
	Average value (ms)	SD	Average value (ms)	SD
1	3332	2066	2733	700
2	2776	1003	2657	627
3	2633	1033	2477	558
4	2437	863	2954	1009
5	2516	526	2875	1545
6	2543	677	2757	1726

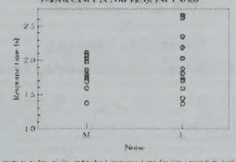


Figure 8. The average value of the individual response time for the secondary task during Test II.

For the primary task in test II (the short term reaction time test), no significant differences could be seen between the two noise exposures in response time or number of correct answers. The average value of the individual response time for the secondary task during test II is shown in Figure 8. In Figure 8 it may be observed that the response time for the secondary task during test II was longer for some subjects in the low frequency noise exposure. This difference was however not statistically significant.

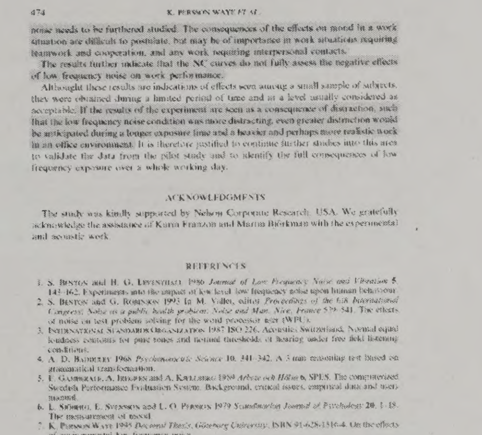
No difference was observed for test I in relation to the different noise exposures.

The relation between the subjective estimated interference with performance caused by low frequency noise and the response time for the last three periods during test III was 0·46 (value for 95% significance level is 0·49 Pearson's correlation coefficient). No relation was seen for the mid frequency noise ($r = 0·08$). A significant relation was found between reduced activity and performance time during the last three periods of test III for both noises, although this relation was stronger for the low frequency noise, $r = 0·79$, $p < 0·01$ and $r = 0·49$, $p < 0·05$ for low and mid frequency noise respectively.

Apart from tiredness, the reported symptoms and effects on mood agreed with earlier findings on effects after exposure to low frequency noise. The subjects reported a feeling of pressure on the head rather than headache and lower social orientation and pleasantness after low frequency noise exposure [7].

5. CONCLUSION

The results showed that the low frequency noise was estimated to interfere more strongly with performance. The results also gave some indications that cognitive demands were less well coped with under the low frequency noise condition. This effect was especially pronounced in the last parts of the tests, which indicates that the effects appear over time. If this effect can be verified in further studies, it could be hypothesized that the low frequency exposure was more difficult to habituate to. The relation between the reduced activity and response time, which was especially pronounced in the low frequency noise condition, may also indicate that increased fatigue was of importance for the results. The underlying mechanisms responsible for reduced performance caused by low frequency



noise needs to be furthered studied. The consequences of the effects on mood in a work situation are difficult to postulate, but may be of importance in work situations requiring teamwork and cooperation, and any work requiring interpersonal contacts.

The results further indicate that the NC curves do not fully assess the negative effects of low frequency noise on work performance.

Althought these results are indications of effects seen among a small sample of subjects, they were obtained during a limited period of time and at a level usually considered as acceptable. If the results of the experiment are seen as a consequence of distraction, such that the low frequency noise condition was more distracting, even greater distraction would be anticipated during a longer exposure time and a heavier and perhaps more realistic work in an office environment. It is therefore justified to continue further studies into this area to validate the data from the pilot study and to identify the full consequences of low frequency exposure over a whole working day.

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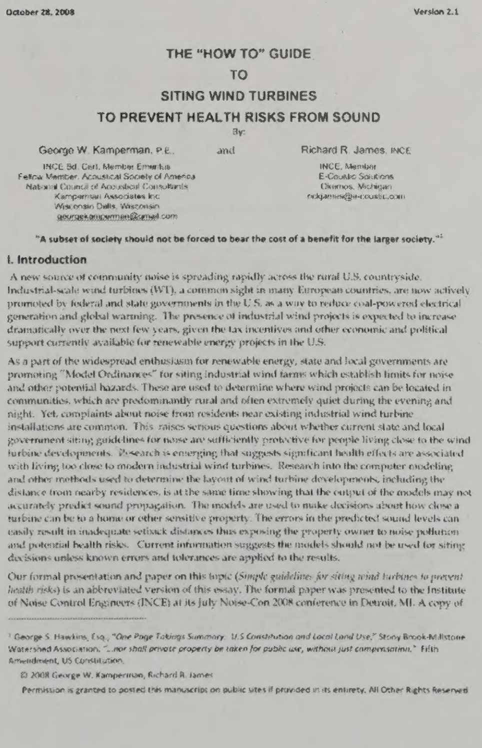

THE "HOW TO" GUIDE
TO
SITING WIND TURBINES
TO PREVENT HEALTH RISKS FROM SOUND

By:

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"A subset of society should not be forced to bear the cost of a benefit for the larger society."[1]

I. Introduction

A new source of community noise is spreading rapidly across the rural U.S. countryside. Industrial-scale wind turbines (WT), a common sight in many European countries, are now actively promoted by federal and state governments in the U.S. as a way to reduce coal-powered electrical generation and global warming. The presence of industrial wind projects is expected to increase dramatically over the next few years, given the tax incentives and other economic and political support currently available for renewable energy projects in the U.S.

As a part of the widespread enthusiasm for renewable energy, state and local governments are promoting "Model Ordinances" for siting industrial wind farms which establish limits for noise and other potential hazards. These are used to determine where wind projects can be located in communities, which are predominantly rural and often extremely quiet during the evening and night. Yet, complaints about noise from residents near existing industrial wind turbine installations are common. This raises serious questions about whether current state and local government siting guidelines for noise are sufficiently protective for people living close to the wind turbine developments. Research is emerging that suggests significant health effects are associated with living too close to modern industrial wind turbines. Research into the computer modeling and other methods used to determine the layout of wind turbine developments, including the distance from nearby residences, is at the same time showing that the output of the models may not accurately predict sound propagation. The models are used to make decisions about how close a turbine can be to a home or other sensitive property. The errors in the predicted sound levels can easily result in inadequate setback distances thus exposing the property owner to noise pollution and potential health risks. Current information suggests the models should not be used for siting decisions unless known errors and tolerances are applied to the results.

Our formal presentation and paper on this topic (*Simple guidelines for siting wind turbines to prevent health risks*) is an abbreviated version of this essay. The formal paper was presented to the Institute of Noise Control Engineers (INCE) at its July Noise-Con 2008 conference in Detroit, MI. A copy of

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[1] George S. Hawkins, Esq., *"One Page Takings Summary. U.S Constitution and Local Land Use,"* Stony Brook-Millstone Watershed Association. *"...nor shall private property be taken for public use, without just compensation."* Fifth Amendment, US Constitution.

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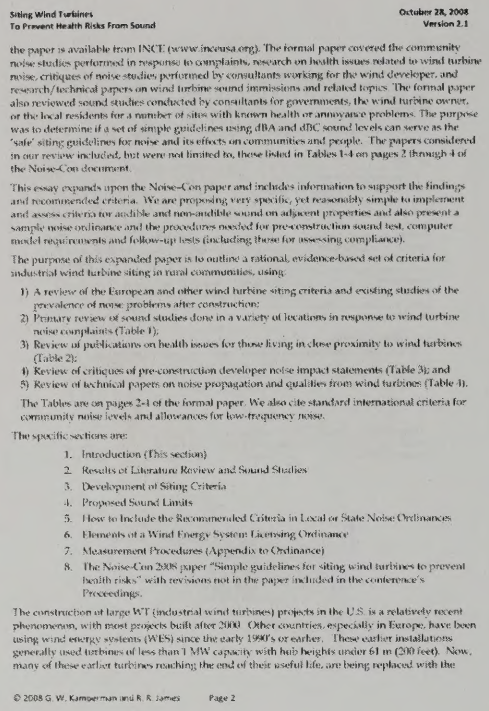


the paper is available from INCE (www.inceusa.org). The formal paper covered the community noise studies performed in response to complaints, research on health issues related to wind turbine noise, critiques of noise studies performed by consultants working for the wind developer, and research/technical papers on wind turbine sound immissions and related topics. The formal paper also reviewed sound studies conducted by consultants for governments, the wind turbine owner, or the local residents for a number of sites with known health or annoyance problems. The purpose was to determine if a set of simple guidelines using dBA and dBC sound levels can serve as the 'safe' siting guidelines for noise and its effects on communities and people. The papers considered in our review included, but were not limited to, those listed in Tables 1-4 on pages 2 through 4 of the Noise-Con document.

This essay expands upon the Noise-Con paper and includes information to support the findings and recommended criteria. We are proposing very specific, yet reasonably simple to implement and assess criteria for audible and non-audible sound on adjacent properties and also present a sample noise ordinance and the procedures needed for pre-construction sound test, computer model requirements and follow-up tests (including those for assessing compliance).

The purpose of this expanded paper is to outline a rational, evidence-based set of criteria for industrial wind turbine siting in rural communities, using:

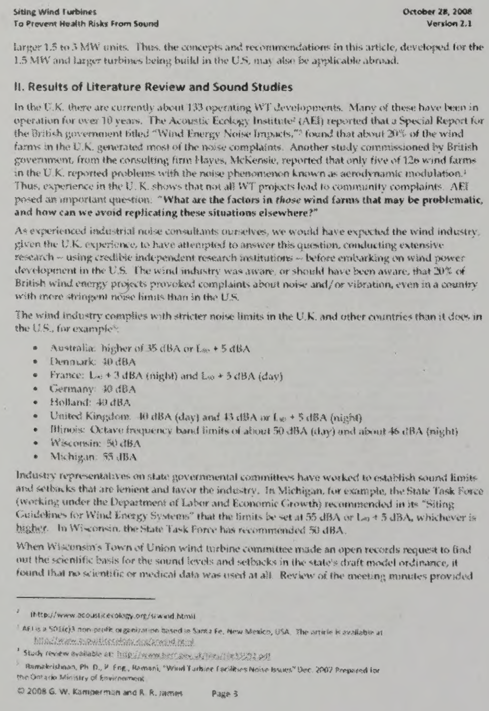
1) A review of the European and other wind turbine siting criteria and existing studies of the prevalence of noise problems after construction;
2) Primary review of sound studies done in a variety of locations in response to wind turbine noise complaints (Table 1);
3) Review of publications on health issues for those living in close proximity to wind turbines (Table 2);
4) Review of critiques of pre-construction developer noise impact statements (Table 3); and
5) Review of technical papers on noise propagation and qualities from wind turbines (Table 4).

The Tables are on pages 2-4 of the formal paper. We also cite standard international criteria for community noise levels and allowances for low-frequency noise.

The specific sections are:

1. Introduction (This section)
2. Results of Literature Review and Sound Studies
3. Development of Siting Criteria
4. Proposed Sound Limits
5. How to Include the Recommended Criteria in Local or State Noise Ordinances
6. Elements of a Wind Energy System Licensing Ordinance
7. Measurement Procedures (Appendix to Ordinance)
8. The Noise-Con 2008 paper "Simple guidelines for siting wind turbines to prevent health risks" with revisions not in the paper included in the conference's Proceedings.

The construction of large WT (industrial wind turbines) projects in the U.S. is a relatively recent phenomenon, with most projects built after 2000. Other countries, especially in Europe, have been using wind energy systems (WES) since the early 1990's or earlier. These earlier installations generally used turbines of less than 1 MW capacity with hub heights under 61 m (200 feet). Now, many of these earlier turbines reaching the end of their useful life, are being replaced with the



larger 1.5 to 3 MW units. Thus, the concepts and recommendations in this article, developed for the 1.5 MW and larger turbines being build in the U.S. may also be applicable abroad.

II. Results of Literature Review and Sound Studies

In the U.K. there are currently about 133 operating WT developments. Many of these have been in operation for over 10 years. The Acoustic Ecology Institute[2] (AEI) reported that a Special Report for the British government titled "Wind Energy Noise Impacts,"[3] found that about 20% of the wind farms in the U.K. generated most of the noise complaints. Another study commissioned by British government, from the consulting firm Hayes, McKensie, reported that only *five* of 126 wind farms in the U.K. reported problems with the noise phenomenon known as aerodynamic modulation.[4] Thus, experience in the U. K. shows that not all WT projects lead to community complaints. AEI posed an important question. "**What are the factors in *those* wind farms that may be problematic, and how can we avoid replicating these situations elsewhere?"**

As experienced industrial noise consultants ourselves, we would have expected the wind industry, given the U.K. experience, to have attempted to answer this question, conducting extensive research – using credible independent research institutions – before embarking on wind power development in the U.S. The wind industry was aware, or should have been aware, that 20% of British wind energy projects provoked complaints about noise and/or vibration, even in a country with more stringent noise limits than in the U.S.

The wind industry complies with stricter noise limits in the U.K. and other countries than it does in the U.S., for example[5]:

- Australia: higher of 35 dBA or L_{90} + 5 dBA
- Denmark: 40 dBA
- France: L_{90} + 3 dBA (night) and L_{90} + 5 dBA (day)
- Germany: 40 dBA
- Holland: 40 dBA
- United Kingdom: 40 dBA (day) and 43 dBA or L_{90} + 5 dBA (night)
- Illinois: Octave frequency band limits of about 50 dBA (day) and about 46 dBA (night)
- Wisconsin: 50 dBA
- Michigan: 55 dBA

Industry representatives on state governmental committees have worked to establish sound limits and setbacks that are lenient and favor the industry. In Michigan, for example, the State Task Force (working under the Department of Labor and Economic Growth) recommended in its "Siting Guidelines for Wind Energy Systems" that the limits be set at 55 dBA or L_{90} + 5 dBA, whichever is higher. In Wisconsin, the State Task Force has recommended 50 dBA.

When Wisconsin's Town of Union wind turbine committee made an open records request to find out the scientific basis for the sound levels and setbacks in the state's draft model ordinance, it found that no scientific or medical data was used at all. Review of the meeting minutes provided under the request showed that the limits had been set by Task Force members representing the wind industry.[6] This may explain why state level committees or task forces have drafted ordinances with upper limits of 50 dBA or higher instead of the much lower limits applied to similar projects in other countries. There is no independent, scientific or medical support for claims that locating 400+ foot tall wind turbines as close as 1000 feet (or less) to non-participating properties will not create noise disturbances, economic losses or other risks.[7] But, there is considerable independent research supporting that this will result in public health risks and other negative impacts on people and property.

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[2] Http://www.acousticecology.org/srwind.html

AEI is a 501(c)3 non-profit organization based in Santa Fe, New Mexico, USA. The article is available at http://www.acousticecology.org/srwind.html

[3] Study review available at: http://www.berr.gov.uk/files/file35201.pdf

[5] Ramakrishnan, Ph. D., P. Eng., Ramani, "Wind Turbine Facilities Noise Issues" Dec. 2007 Prepared for the Ontario Ministry of Environment

To illustrate the way a typical WT developer responds to a question raised by a community committee about noise and health the following example is presented and discussed:

> **Q: 19. What sound standards will EcoEnergy ensure that the turbines will be within, based on the setbacks EcoEnergy plans to implement, and what scientific and peer reviewed data do you have to ensure and support there will be no health and safety issues to persons within your setbacks?**
>
> **Answer:** As mentioned, turbines are sited to have maximum sound level of 45dBA. These sound levels are well below levels causing physical harm. Medical books on sound indicate sound levels above 80-90dBA cause physical (health) effects. The possible effects to a person's health due to "annoyance" are impossible to study in a scientific way, as these are often mostly psychosomatic, and are not caused by wind turbines as much as the individuals' obsession with a new item in their environment.
>
> **From EcoEnergy's "Response to the Town of Union Health & Safety Research Questionnaire"**
> By Curt Bjurlin, M.S., Wes Slaymaker, P.E., Rick Gungel, P.E., EcoEnergy, L.L.C., submitted to Town of Union, Wisconsin and Mr. Kendall Schneider, on behalf of the Town of Union

A serious question was asked and it deserves a responsible answer. The committee, charged with fact-finding, sought answers they presumed would be based on independent, peer-reviewed studies. Instead, the industry response was spurious and misleading, and did not address the question. It stated that the turbines will be located so as to produce maximum sound levels of 45 dBA, the tone and context implying that 45 dBA is fully compatible with the quiet rural community setting. No acknowledgement is made of the dramatic change this will be for the noise environment of nearby families. No mention is made of how the WT, once in operation, will raise evening and nighttime background sound levels from the existing background levels of 20 to 30 dBA to 45 dBA. There is no disclosure of the considerable low frequency content of the WT sound; in fact, there are often claims to the contrary. They fail to warn that the home construction techniques used for modern wood frame homes result in walls and roofs that cannot block out WT low frequencies.

There is no mention of the nighttime sound level recommendations set by the World Health Organization (WHO) in its reports, *Guidelines for Community Noise*[8] and "Report on the third

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[6] Lawton, Catharine M., Letter to Wisconsin's "Guidelines and Model Ordinances Ad Hoc Subcommittee of the Wisconsin Wind Power Siting Collaborative" in Response to Paul Helgeson's 9/20/00 "Wisconsin Wind Ordinance Egroups E-Mail Message," Sept. 20, 2000, a Public Record obtained through Open Meetings Act request by the Town of Union, Wisconsin, Large Wind Turbine Citizens Committee.

[7] It is worth noting that the 2007-06-29 version of the Vestas Mechanical Operating and Maintenance Manual for the model V90 – 3.0 MW VCRS 60 Hz turbine includes this warning for technicians and operators:

> "2. Stay and Traffic by the Turbine
>
> Do not stay within a radius of 400m (1300ft) from the turbine unless it is necessary. If you have to inspect an operating turbine from the ground, do not stay under the rotor plane but observe the rotor from the front.
>
> Make sure that children do not stay by or play nearby the turbine. …"

[8] Available at http://www.who.int/docstore/peh/noise/guidelines2.html

meeting on night noise guidelines."[9] In these documents WHO recommends that **sound levels during nighttime and late evening hours should be less than 30 dBA during sleeping periods to protect children's health**. They noted that a child's autonomic nervous system is 10 to 15 dB more sensitive to noise than is an adult. Even for adults, health effects are first noted in some studies when the sound levels exceed 32 dBA L_{Amax}. These sounds are 10-20 dBA lower than the sound levels needed to cause awakening.

For sounds that contain a strong low frequency component, which is typical of wind turbines, WHO says that the limits may need to be even lower than 30 dBA to avoid health risks. Further, they recommend that the criteria use dBC frequency weighting instead of dBA for sources with low frequency content. When WT sound levels are 45 dBA outside a home, we may find that the interior sound levels will drop to the 30 dBA level recommended for sleeping areas but low frequency noise only decreased 6-7 dBC from outside to inside. That could create a sleep problem because the low frequency content of the noise can penetrate the home's walls and roof with little reduction. An example demonstrating how WT sound is affected by walls and windows is provided later in this document.

The wind turbine developers in the excerpt above do not disclose that the International Standards Organization (ISO) in ISO 1996-1971 recommends 25 dBA as the maximum night-time limit for rural communities. As can be seen in the table below, sound levels of 40 dBA and above are only appropriate in suburban communities during the day and urban communities during day and night. There are no communities where 45 dBA is considered acceptable at night.

ISO 1996-1971 Recommendations for Community Noise Limits (dBA)			
District Type	Daytime Limit	Evening Limit 7-11pm	Night Limit 11pm-7am
Rural	35dB	**30dB**	**25dB**
Suburban	40dB	35dB	**30dB**
Urban residential	45dB	40dB	35dB
Urban mixed	50dB	45db	40dB

Further, the wind industry claims, "*These sound levels are well below levels causing physical harm. Medical books on sound indicate sound levels above 80-90dBA cause physical (health) effects.*" Concern about sound levels in the 80-90 dBA range is for hearing health (your ears) and not the health-related issues of sleep disturbance and other symptoms associated with prolonged exposure to low levels of noise with low frequency and amplitude modulation such as the sound emitted by modern wind turbines. This type of response is a non-answer. It is an overt attempt to mislead while giving the appearance of providing a legitimate response.

Furthermore, the statement, *"The possible effects to a person's health due to 'annoyance' are impossible to study in a scientific way, as these are often mostly psychosomatic, and are not caused by wind turbines as much as the individuals' obsession with a new item in their environment,"* is both inaccurate and misleading. It ignores the work of researchers such as Pedersen, Harry, Phipps, and Pierpont on wind turbine effects specifically, and the numerous medical research studies reviewed by Frey and Hadden. The studies belie the claims of the wind industry. This "failure to locate" published

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[9] Available at: http://www.euro.who.int/Noise/activities/20040721_1 References found in Report on third meeting at pages 13 and others.

studies that are readily available on the internet as to make some interpret the claim of "no medical research" as a conscious decision to not look for it. Those companies that do acknowledge the existence of medical research take the position that it is not credible for one or another reason and thus can be ignored.

Making statements outside their area of competence, wind industry advocates, without medical qualifications, label complaints of health effects as "psychosomatic" in a pejorative manner that implies the complaints can be discounted because they are not "really medical" conditions. Such a response cannot be considered to be based in fact. It is, at best, an opinion. It ignores the work of many researchers, including the World Health Organizations, on the effect of sounds during nighttime hours that result in sleep disturbance and other disorders with physical, not just psychological, pathologies.[10,11] Many people find it difficult to articulate what has changed. They know something is different from before the wind turbines were operating and they may express it as feeling uncomfortable, uneasy, sleepless, or some other symptom, without being able to explain why it is happening.

Our review of the studies listed in Tables 1-4 of our Noise-Con paper show that some residents living as far as 3 km (1.86 mi) from a wind farm complain of sleep disturbance from the noise. Many residents living 1/10 of this distance (300 m or 984 ft) from wind farms experience major sleep disruption and other serious medical problems from nighttime wind turbine noise. The peculiar acoustic characteristics of wind turbine noise immissions[12] cause the sounds at the receiving properties to be more annoying and troublesome than the more familiar noise from traffic and industrial factories. Limits used for these other community noise sources are not appropriate for siting modern industrial wind turbines. The residents who are annoyed by wind turbine noise complain of the repetitive, approximately once-per-second (1 Hz) "swoosh-boom-swoosh-boom" sound of the turbine blades and of "low frequency" noise. It is not clear to us whether the complaints about "low frequency" noise are about the audible low frequency part of the "swoosh-boom" sound, the once-per-second amplitude modulation (amplitude modulation means that the sound varies in loudness and other characteristics in a rhythmic pattern) of the "swoosh-boom" sound, or some combination of the two.

Figure 1 of our Noise Con paper, reproduced as Figure 1, below, shows the data from one of the complaint sites plotted against the sound immission spectra for a modern 2.5 MWatt wind turbine; A home in the United States at 2km distance, Young's threshold of perception for the 10% most sensitive population (ISO 0266), and a spectrum obtained for a rural community during a three hour, 20 minute test from 11:45 pm until 3:05 am on a windless June evening near Ubly, Michigan. This is a quiet rural community located in central Huron County (also called Michigan's Thumb). It is worth noting that this sound measurement sample demonstrates how quiet a rural community can be when located at a distance from industry, highways, and airport related noise emitters.

The line representing the threshold of perception is the focus of this graph. The remaining graphs show sound pressure levels (dB) at each of the frequency ranges from the lowest inaudible sounds at the left, to sounds that "rumble" (20Hz to about 200 Hz) and then those in the range of communication (200Hz through about 4000Hz) through high pitched sounds (up to 10,000 Hz). At

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[10] WHO European Centre for Environment and Health, Bonn Office, "Report on the third meeting on night noise guidelines," April 2004.

[11] According to Online Etymology Dictionary, psychosomatic means "pertaining to the relation between mind and body, ... applied from 1938 to physical disorders with psychological causes."

[12] *Emissions* refer to acoustic energy from the viewpoint of the sound emitter, while *immissions* refer to acoustic energy from the viewpoint of the receiver.

each frequency where the graphs of sound pressures are above (exceed) the graph showing perception the wind turbine sounds would be perceptible or audible. The more the wind turbine sound exceeds the perception curve the more pronounced it will be. When it exceeds the quiet rural background sound level (L_{A90}) it will not be masked or obscured by the rural soundscape.

The over-all sounds from each of the frequency bands are summed and presented on the right hand side of the graph. These are presented with corrections for A-weighting (dBA) and C-weighting (dBC). These show that if only dBA criteria are used to assess and limit wind turbine sound the low frequency content of the wind turbines emissions are not revealed. Note that in many cases the values for dBC are almost 20 dB higher than the dBA values. This is the basis for the WHO warning that when low frequency sound content is present outside a home dBA is not an appropriate method of describing predicted noise impacts, sound limits, or criteria.

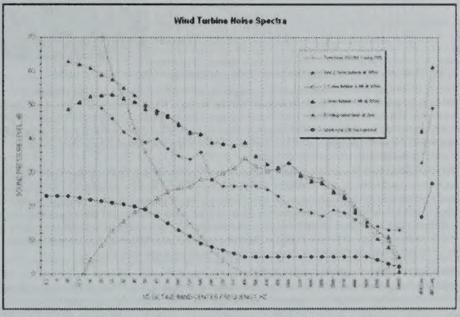

Figure 1-Graph Of Wind Turbine Sounds Vs. Rural Background And Threshold Of Perception

(Note: The lowest L_{A90} and L_{C90} shown at right are measured background L_{A90} and L_{C90}. The L_{eq} values could be 3-5 dB higher)

Our review of the studies listed in Tables 1-4 in the Noise-Con paper at the end of this document, provided answers to a number of significant questions we had, as acoustical engineers, regarding the development of siting guidelines for industrial-scale wind turbines. They are provided below for easy of reading and continuity:

Do international, national, or local community noise standards for siting wind turbines near dwellings address the low frequency portion of the wind turbines' sound immissions? No. State and local governments are in the process of establishing wind farm noise limits and/or wind turbine setbacks from nearby residents, but the standards incorrectly assume that limits based on dBA levels are sufficient to protect the residents.

Do wind farm developers have noise limit criteria and/or wind turbine setback criteria that apply to nearby dwellings? Yes. But the industry-recommended wind turbine noise levels (typically 50-55 dBA) are too high for the quiet nature of the rural communities and may be unsafe for the nearest residents. An additional concern is that some of the methods for pre-construction computer modeling may predict sound levels that are too low. These two factors combined can lead to post-construction complaints and health risks.

An example of a condition that complies with

Are all residents living near wind farms equally likely to be affected by wind turbine noise? No. Children, people with certain pre-existing medical conditions, and the elderly are likely to be the most susceptible. Some people are unaffected while nearby neighbors develop serious health problems caused by exposure to the same wind turbine noise.

How does wind turbine noise impact nearby residents? Wind turbine-associated symptoms include sleep disturbance, headache, ringing in the ears, dizziness, nausea, irritability, and problems with memory, concentration, and problem solving, as described in the first paper in this volume.

What are the technical options for reducing wind turbine noise immission at residences? There are only two options: 1) increase the distance between the source and receiver, or 2) reduce the source sound power emission. Either solution is incompatible with the objective of the wind farm developer, which is to maximize the wind power electrical generation within the land available.

Is wind turbine noise at a residence much more annoying than traffic noise? Yes. Researchers have found that, "Wind turbine noise was … found to cause annoyance at sound pressure levels lower than those known to be annoying for other community noise sources, such as road traffic. . .Living in a clearly rural area in comparison with a suburban area increases the risk of annoyance with wind turbine noise.[13]" In other papers by Pedersen wind turbine noise was perceived by about 85% of respondents to the study at sound levels as low as 35.0-37.5 dBA.[14] Currently, this increased sensitivity is believed to be due to the presence of amplitude modulation in the wind turbine's sound emissions which limits the masking effect of other ambient sounds and the low frequency content which is associated with the sounds inside homes and other buildings.

Amplitude modulation is a continuing change in the sound level in synchronization with the turning of the wind turbine's blades. An example of amplitude modulation is shown in the figure 2 below. This figure shows the constantly varying dBA sound level in the graph at the top. The sound level varies from a low of 40 dBA to a high of 45 dBA repeating every 1.3 seconds continuously when the turbine is operating. The turbine is located approximately 1200 feet from the farmhouse. The photo shows the turbine that was dominant during this test.

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[13] Pedersen E, Bouma J, Bakker R and Van den Berg F, "Wind Farm perception: A study on acoustic and visual impact of wind turbines on residents in the Netherlands," 2nd International Meeting on Wind Turbine Noise, Lyon France, Sept. 20-21, 2007 (Pages 2 and 3)

[14] Pedersen E and Persson Waye K. 2004. Perceptions and annoyance due to wind turbine noise -- a dose-response relationship. J Acoust Soc Am 116(6): 3460-3470

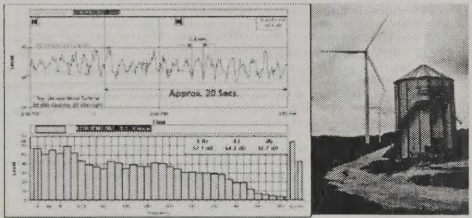

Figure 2 Amplitude Modulation at a farmhouse (Study sponsored by CCCRE, Calumet, Wisconsin)

It is worth noting that this measurement averages about 43 dBA (L_{eq}) which is very close to the sound level predicted for a single turbine at 1000 feet in Figure 1 (solid red line with solid triangle markers). The lower graph shows the frequency spectrum at approximately 9:49 PM at a low point in the amplitude modulation. (The frequency chart's cursor is the vertical line at the upper graph's midpoint.) Note the dominance of sound energy in the lower frequency range. This was also present in the model's predictions in Figure 1.

It is not hard to understand why many people in this community feel that they have been forced to accept noise pollution as a side effect of the wind project. Even though the 40 to 45 dBA sound levels in this example may comply with the 50 dBA limits adopted by the host county from the Wisconsin Model Ordinance the impact on the people near the wind project are subjected to noise pollution. This example demonstrates why criteria set at 50 dBA or higher do not protect the health and economic welfare of people living in the host communities. Adopting criteria such as those recommended later in this essay can prevent these situations from occurring.

Low frequency noise is a problem inside buildings

When low frequency sound is present outside homes and other occupied structures, it is often more an indoor problem than an outdoor one. This is very true for wind turbine sounds.

Why do wind turbine noise immissions of only 35 dBA disturb sleep at night? Affected residents complain of the middle- to high-frequency, repetitive swooshing sounds of the rotating turbine blades at a constant rate of about 1 Hz, plus low frequency noise. The amplitude modulation of the "swooshing" sound changes continuously. Residents also describe a thump or low frequency banging sound that varies in amplitude up to 10 dBA in the short interval between the swooshing sounds. This may be a result of sounds from multiple wind turbines with similar spectral content combining to increase and decrease the sound over and above the effects of modulation. [Note: These effects (e.g. phasing and coherence effects) are not normally considered in predictive models.] It may also be a result of turbulence of the air and wind on wind turbine operations when the blades are not at an optimum angle for noise emissions and/or power generation. It is also a result of sounds penetrating homes and other buildings at night and at other times where quiet is needed. When low frequency sound is present outside homes and other occupied structures, it is

often more likely to be an indoor problem than an outdoor one. This is very true for wind turbine sounds.

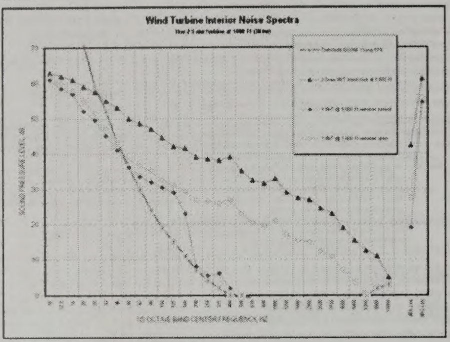

Figure 3-A Single Wind Turbine Sound Inside Home @ 1000 Feet

The usual assumption about wall and window attenuation being 15 dBA or more, which is valid for most sources of community noise, may not be sufficiently protective given the relatively high amplitude of the wind turbines' low frequency immission spectra. Figures 2 and 3 demonstrate the basis for this concern.

To demonstrate the effects of outdoor low frequency content from wind turbines we prepared Figure 3 showing the effect of a single turbine (propagation model based on sound power level test data) at 1000 feet and then in Figure 4 projected the impact of ten (10) similar turbines at one (1) mile. We applied the façade sound isolation data from the Canada Research Council to the wind turbine example used in our Noise-Con 2008 paper and shown in Figure 1 above. The graphs each show the outdoor sound pressure levels predicted for the distance of 1000 feet and one mile as the upper graph line respectively. The curve showing the threshold of human perception for sounds at each 1/3 octave band center is also plotted. When the graphs representing wind turbine sound have data points above this threshold curve the sounds will be perceptible to at least 10% of the population (which includes most children).

In addition to the top graph line representing the sounds outside the home there are two other graph lines for the sounds inside the home[15]. One curve represents the condition of no open windows and the other represents one open window.

With just one turbine at 1,000 feet there is a significant amount of low frequency noise above hearing threshold within rooms having exterior walls without windows or very well sealed windows. Even with the windows closed the sound pressure levels in the 63 Hz to 200 Hz one-octave bands still exceed the perception curve, in many cases by more than 10 dB. Note the perceptible sound between 50 and 200 Hz with a wall resonance frequency at 125 Hz (2 X 4 studs on 16 inch centers) for the "windows closed" condition. This would be perceived as a constant low rumble, which would be present inside homes whenever the turbines are operating.

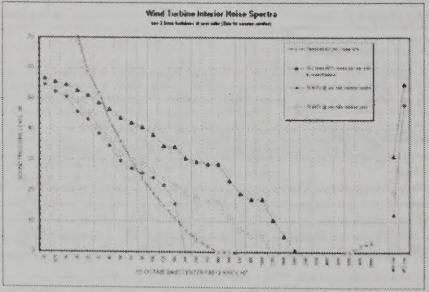

Figure 4-Sound from Ten (10) Wind Turbines inside home at One Mile

When comparing the dBC values the difference between inside sounds and outside is much less. The maximum difference in this example is only 7 dBC and that is for the situation with windows closed. With windows open the sound inside the home would be 56 dBC while it is 61 dBC outside; a difference of only 5 dBC[16,17,18]. If we looked only at dBA it would appear that the home's walls and roof provide a reduction of 15 dBA or more. But, that that would be misleading because it ignores the effects of low frequency sound.

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[15] The typical wood stud exterior used in modern home construction is vinyl siding over 1/2 inch OSB or rigid fiberglass board applied to 2 X 4 studs with the stud space filled with thermal and 1/2 inch gypsum board applied on the exposed interior side. This has a mass of about 3-4 lbs/sq ft and low 26 STC.

[16] The basis for these predictions includes reports on aircraft sound insulation for dwellings and façade sound isolation data from the Canada Research Council.

[17] "On the sound insulation of wood stud exterior walls" by J. S. Bradley and J. S. Birta, Institute for Research in Construction, National Research Council, Montreal Road, Ottawa K1A 0R6, Canada, published: J Acoust. Soc. Am. 110 (6), December 2001

We next increased the number of 2.5 Mw turbines from one to ten and moved the receiver one mile from the closest turbine. We assumed the acoustic center for the ten turbines to be 2km (1-1/4 miles) from the receiver. These results are presented in Figure 4. We were surprised to find that the one mile low frequency results are only 6.3 dB below the 1,000 foot one turbine example.

There is one other characteristic of wind turbine sound that increases the sleep disturbance potential above that of other long-term noise sources. The amplitude modulation of the sound emissions from the wind turbines create a repetitive rise and fall in sound levels synchronized to the blade rotation speed. Many common weather conditions increase the magnitude of amplitude modulation. Most of these occur at night. The graph in Figure 5 shows this effect in the first floor bedroom of a farm home in the U.K. The home is located 930 meters (3,050 feet) from the nearest turbine. The conditions documented by an independent acoustical consultant show the sound level varying over 9 dBA range from 28 to 37 dBA. The pattern repeats approximately every second often for hours at a time. For many people, especially seniors, children and those with pre-existing medical conditions, this represents a major challenge to restful sleep.

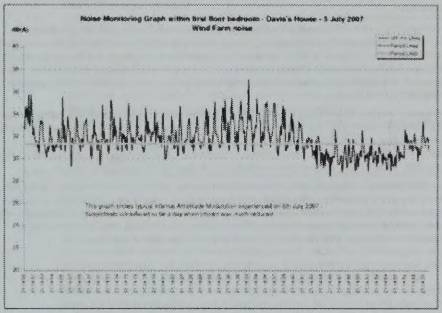

Figure 5- Amplitude modulation in a home 930 meters (3000 feet) from the nearest turbine.[19]

This may explain why some residents as far as two (2) miles from a wind farm find the wind turbines sounds highly annoying. It also demonstrates the primary reason why relying on dBA

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[18] Dan Hoffmeyer, Birger Plovsing: "Low Frequency Noise from Large Wind Turbines, Measurements of Sound Insulation of Facades." Journal no. AV 1097/08, Client: Danish Energy Authority, Amaliegade 44, 1256 Copenhagen

[19] This chart used with permission of Mike Stigwood, MIOA, FRSH, MAS Environmental, U.K. and the Davis family

alone will not work for community noise criteria. It is the low frequency phenomena associated with wind turbine emissions that makes the dBC test criteria an important part of the proposed criteria[20].

III. Development of Siting Criteria

Basis For Using L_{A90} To Determine Pre-Construction Long-Term Background Sound

We began our research into guidelines for proper siting by reviewing guidelines used in other countries to limit WT sound emissions. A recent compendium of these standards was presented in the report "Wind Turbine Facilities Noise Issues."[21] We found common ground in many of them. Some set explicit not-to-exceed sound level limits, for example, in Germany, 40 dBA nighttime in residential areas and 35 dBA nighttime in rural and other noise-sensitive areas. Other countries use the existing background sound levels for each community as the basis for establishing the sound level limits for the WES project. This second method has the advantage of adjusting the allowable limits for various background soundscapes. It makes use of a standard method for assessing background sound levels by measuring over a specified period of observation to determine the sound level exceeded 90% of the time (L_{90}) during the night. The night is important because it is the most likely time for sleep disturbance. Then, using the background sound level as the base, the WES project is allowed to increase it by 5 dBA. It is this second method (L_{90} + 5 dBA) that was adopted for the criteria in this document. It has the advantage of adjusting the criteria for each community without the need for tables of allowable limits for different community types. The focus is only on the nighttime criteria. This is because the WES will operate 24 hours a day and the nighttime limits will be the controlling limits whether or not there are other limits for daytime.

Wind turbine noise is more annoying than other noises and needs lower limits
Since many rural communities are very quiet, it is possible that some will have L_{90} values of 25 dBA or lower. This may seem extreme when compared to limits usually imposed on other sources of community noise. However, wind turbine sounds are not comparable to the more common noise sources of vehicles, aircraft, rail, and industry. Several studies have shown that annoyance to wind turbine sounds begins at levels as low as 30 dBA.[22] This is especially true in quiet rural communities that have not had previous experience with industrial noise sources. This increased sensitivity may be due to the periodic 'swoosh' from the blades in the quiet rural soundscape, or it may be more complex. In either case, it is a legitimate response to wind turbine sound documented in peer-reviewed research.

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[20] Hessler Jr., George F., "Proposed criteria in residential communities for low-frequency noise emissions from industrial sources," 52(4), 179-185, (July Aug 2004)

[21] Ramani Ramakrishnan, Ph.D., P. Eng., "Wind Turbine Facilities Noise Issues," December 2007. Prepared for the Ontario Ministry of Environment

[22] Eja Pedersen, "Human response to wind turbine noise: perception, annoyance and moderating factors." Dissertation, Occupational and Environmental Medicine, Department of Public Health and Community Medicine, Goteborg University, Goteborg, Sweden, 2007, and

Van den Berg F, Pedersen E, Bouma J, and Bakker R. Wind Farm Perception, Final Report Project no. 044628, University of Gothenburg and Medical Center Groningen, Netherlands June 3, 2008

The World Health Organization recognizes the special place of low frequency noise as an environmental problem. Its publication "Community Noise" (Berglund et al., 2000) makes a number of references to low frequency noise, some of which are as follows:

- "It should be noted that low frequency noise ... can disturb rest and sleep even at low sound levels.
- For noise with a large proportion of low frequency sounds a still lower guideline (than 30dBA) is recommended.
- When prominent low frequency components are present, noise measures based on A-weighting are inappropriate.
- Since A-weighting underestimates the sound pressure level of noise with low frequency components, a better assessment of health effects would be to use C-weighting.
- It should be noted that a large proportion of low frequency components in a noise may increase considerably the adverse effects on health."

WHO also states: "The evidence on low frequency noise is sufficiently strong to warrant immediate concern."

Available at http://www.who.int/docstore/peh/noise/guidelines2.html. References found at pages ix, xii through xv and others.

Noise criteria need to take into account low frequency noise
In the table to the right are a series of observations and recommendations by the World Health Organization (WHO) supporting the need for stricter limits when there is substantial low frequency content in outdoor sound. Our review of other studies, and our own measurements, has demonstrated that wind turbine sound includes considerable low frequency content. We include a dBC limit in our guidelines to address the WHO recommendation that when low frequency sound may be present, criteria based on measurements using a C-weighting filter on the sound level meter (dBC) are needed in addition to dBA criteria.

IV. Proposed Sound Limits

The simple fact that so many residents complain of low frequency noise from wind turbines is clear evidence that the single A-weighted (dBA) noise descriptor used in most jurisdictions for siting turbines is not adequate. The only other simple audio frequency weighting that is standardized and available on sound level meters is C-weighting or dBC. A standard sound level meter set to measure dBA is increasingly less sensitive to low frequency below 500 Hz (one octave above middle-C). The same sound level meter set to measure dBC is equally sensitive to all frequencies above 32 Hz (lowest note on grand piano). It is generally accepted that dBC readings are more predictive of perceptual loudness than dBA readings if low frequency sounds are significant.

We are proposing to use the commonly accepted dBA criteria that is based on the pre-existing background sound levels allowing the wind turbine development to increase this by 5 dB (e.g. L_{90} +5) by the audible sounds from wind turbines. According to the New York State Energy Research & Development Authority:

- ". . . A change in sound level of 5 dB will typically result in a noticeable community response; and
- "... A 10 dB increase is subjectively heard as an approximate doubling in loudness, and almost always causes an adverse community response." [23]

To address the lower frequencies that are not considered in A-weighted measurements we are proposing to add limits based on dBC that follow the same scheme as used for dBA limits. The Proposed Sound Limits are presented in the text box at the end of this section.

For the current industrial grade wind turbines in the 1.5 to 3 MWatt (or over) range, the addition of the dBC requirement may result in an increased distance between wind turbines and the nearby

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[23] (*Wind Energy Development: A Guide for Local Authorities in New York;* page 30; New York State Energy Research & Development Authority, Albany, NY October 2002)

residents. For the conditions shown in Figure 1, the distances would need to be increased significantly. This would result in setbacks in the range of 1 km or greater for the current generation of wind turbines if they are to be located in rural areas with little or no low frequency sound from man-made noise sources and where the L_{A90} background sound levels are 30 dBA or lower. In areas with higher background sound levels, turbines could be located somewhat closer, but still at a distance greater than the 305 m (1000 ft.) or smaller setbacks commonly seen in U.S. based wind turbine standards set by many states and used for wind turbine developments.

Following are some additional Questions and Answers that summarize the major points of this discussion relevant to criteria.

What are the typical wind farm noise immission criteria or standards? Limits are not consistent and may vary even within a particular country. Examples are listed above in the section on Results of Literature and Sound Studies.

What is a reasonable wind farm sound immission limit to protect the health of residences? We are proposing a not-to-exceed immission limit of 35 L_{Aeq} and a site-specific limit of L_{A90} + 5 dBA at the closest property line, whichever is exceeded first. We also propose the use of C-weighted criteria to address complaints of wind turbine low frequency noise. For the C-weighted criteria, we propose a site-specific limit of L_{C90} + 5 dBC. We also require that the site-specific L_{Ceq} (dBC) sound level at a receiving property line not exceed the pre-existing L_{A90} dB background sound level + 5dB by more than 20 dB. In other words, the dBC operating immission limit (as L_{Ceq}) at the receiving property line should not be more than 20 dB above the measured dBA (as L_{A90}) pre-construction long-term background sound level + 5dB.[24] This criterion prevents an Immission Spectra Imbalance that often leads to complaints about rumble or other low frequency problems. We also include a not-to-exceed immission limit of 55 and 60 L_{Ceq} at the receiving property line.[25] Use of the multiple metrics and weightings will address the audible and inaudible low frequency portions of wind turbine sound emissions. Exceedances of any of the limits establish non-compliance.

Why should the dBC immission limit not be permitted to be more than 20 dB above the background measured L_{A90}+5 dB? The World Health Organization and others[26] have determined that if a noise has a measured difference between dBC and dBA more than 20 dB, the noise is highly likely to create an annoyance because of the low frequency component.

Isn't L_{A90} the minimum background noise level? Not exactly. This is the sound level that represents the quietest 10% of the time. It is often considered to be the sound level that represents the sounds one hears late in the evening or at night when there are no near-by or short term sounds present. It is very important to establish this "long term background" noise environment at the property line for a potentially impacted residence (L_{A90}) during the **quietest** sleeping hours of the night, between 10 p.m. and 4 a.m.. Why? Because nighttime sleep disturbance has generated the majority of wind farm noise complaints throughout the world those conditions should guide the design of wind projects. ANSI standards define the "long term background sound" as excluding all short term sounds from the test sample using carefully selected sampling times and conditions using ten (10) minute long samples. This means that nature sounds not present during all seasons and wind noise are not to be included in the measurement. Following the procedures in ANSI S12.9, Part 3 for long term background sound the L_{A90} and L_{C90} can be measured with one or more 10-minute measurements during any night when the atmosphere is classified as stable with a light wind from the area of the proposed wind farm. The basis for the immission limits for the proposed wind farm would then be the Nighttime Immission Limits, which we propose to be the minimum ten (10) minute nighttime L_{A90} and L_{C90} plus 5 dB, a test for Spectra Imbalance, and not-to-exceed limits for the period of 10 p.m. to 7 a.m. Daytime Limits (7 a.m. to 10 p.m.) could be set using daytime measurements, but unless the wind utility only operates during the day, the nighttime limit will always be the limiting sound level. Thus, daytime limits are not normally needed

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[24] Hessler Jr., George F., Proposed criteria in residential communities for low-frequency noise emissions from industrial sources, Noise Control Engineering Journal; 52(4), pg. 180 in "2. Purpose of Proposed Criteria," (July Aug 2004)

[25] Ibid, pg. 180 in "3. Proposed Criteria."

[26] Ibid

A nearby industrial scale wind utility meeting these noise immission criteria would occasionally be audible to the residents during nighttime and daytime. However, it would be unlikely for it to be an indoor problem.

The method used for establishing the background sound level at a proposed wind farm in many of the studies in Table 1, does not meet the requirements set by ANSI S12.9 Part 3 for outdoor measurements and determination of long-term background sound levels. Instead, they use unattended noise monitors to record hundreds of 10-minute or one-hour un-observed measurements that include the short term sounds from varying community and wind conditions over a period of days or weeks. The results for daytime and nighttime are usually combined to determine the average wind noise at the microphone as a function of wind velocity measured at a height of ten (10) meters. This provides an enormous amount of data, but the results have little relationship to wind turbine sound immissions or to potential for turbine noise impacts on nearby residents. They also do not comply with ANSI standards for methodology or quality and as such are not suitable for use in measurements that will be used to assess compliance with other standards and guidelines. This exhaustive exercise often only demonstrates how much 'pseudo-noise' is generated by instruments located in a windy environment that exceeds the capability of the instrument's wind screen to protect the microphone. In many cases, this unqualified data is used to support a claim that the wind noise masks the turbines' sound immissions.

The major complaints of residents living near wind farms is sleep disruption at night when there is little or no wind near ground level and the wind turbines located at a much higher elevation are turning and generating near or at maximum power and maximum noise emission. There is usually more surface wind and turbulence during daytime caused by solar radiation. Thus, the use of averaged data involving one or more 24-hour periods is of little value in predicting conditions that will result in people who cannot sleep in their homes during the night because of loud intrusive wind turbine noise.

The methodology used to predict the sound propagation from the turbines into the community also fails to represent the conditions of maximum turbine noise impact on nearby residents. This should be expected given the limitations of models based on ISO 9613-2[27]. They also do not consider the effects of a frequent nighttime condition when winds at the ground are calm and the winds at the hub are at or above nominal operating speed. This condition is often referred to as a "stable" atmosphere. During this condition, the wind turbines can be producing the maximum or near maximum power while the wind at ground level is calm and the background noise level is low The Michigan rural night test data in the earlier figure shows how quiet a night can be in the absence of wind at the ground. This common condition is known to directly cause chronic sleep

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[27] The ISO 9613-2 sound propagation model formulas have known errors of 3 dB even when the conditions being modeled are a perfect match to the limiting conditions specified in the standard. Wind turbines operate far outside the limits for wind speed, height of the noise source above the ground, and other factors identified in the standard thus increasing the likelihood for error above the specified 3 dB. In addition, there are known measurement errors in the IEC61400-11 test that add another 2 dB of uncertainty to the model's predictions.

disruption. Further, the studies report average sound levels and do not disclose the effects of amplitude modulation or low frequency sound which makes the turbine's sound more objectionable and likely to cause sleep problems.

Are there additional noise data to be recorded for a pre-wind turbine noise survey near selected dwellings? Yes. The precision measuring sound level meter(s) need to be programmed to include measurement of L_{Aeq}, L_{A10}, L_{A90}, L_{Ceq}, L_{C10} and L_{C90} with starting time and date for each 10-minute sample. The L_{10} results will be used to validate the L_{90} data. For example, on a quiet night one might expect L_{10} and L_{90} to show similar results within 5 to 10 dB between L_{10} and L_{90} for each weighting scale. On a windy night or one with nearby short term noise sources the difference between L_{10} and L_{90} may be more than 20 dB. There is also often a need to obtain a time-averaged, one-third octave band analysis over the frequency range from 6.3 Hz to 10 kHz during the same ten minute sample. The frequency analysis is very helpful for identifying and correcting for extraneous sounds such as interfering insect noise. An integrating averaging sound level meter meeting ANSI or IEC Type 1 standards has the capability to perform all of the above acoustic measurements simultaneously and store the results internally. There is also a requirement for measurement of the wind velocity near the sound measurement microphone continuously throughout each 10-minute recorded noise sample. The 10-minute maximum wind speed near the microphone must be less than 2 m/s (4.5 mph) during measurements of background noise (L_{90}), and the maximum wind speed for noise measurements during turbine operation must be less than 4 m/s (9 mph). Measurements should be observed (without contaminating the data) and notes identifying short-term noises should be taken for these tests.

Is there a need to record weather data during the background noise recording survey? One weather monitor is required at the proposed wind farm on the side nearest the residents. The weather station sensors are at the standard 10 meter height above ground. It is critical that the weather be recorded every 10 minutes, synchronized with the clocks in the sound level recorders without ambiguity, at the start and end time of each 10 minute period. The weather station should record wind speed and direction, temperature, humidity and rain.

Why do Canada and some other countries base the permitted wind turbine noise immission limits on the operational wind velocity at the 10m height wind speed instead of a maximum dBA or L_{90} + 5 dBA immission level? First, it appears that the wind turbine industry will take advantage of every opportunity to elevate the maximum permitted noise immission level to reduce the setback distance from the nearby dwellings. Including wind as a masking source in the criteria is one method for elevating the permissible limits. The background noise level does indeed increase with surface wind speed. When this happens, it can be argued that the increased wind noise provides some masking of wind turbine noise. However, this is not true if the surface winds are calm. After sunset, when the ground cools (e.g. in the middle of the night), the lower level atmosphere can separate from the higher-level atmosphere. Then, the winds at the ground will be calm while wind at the turbine hub is very strong. Under this condition, the wind velocity at a 10-meter high wind monitoring station (such as those often used for weather reporting) may be ⅓ to ½ the speed of the wind at the hub, yet drop to calm at ground level. The result is that no ground level wind noise is present to mask the sound of the wind turbines, which can be operating at or close to full capacity.

This condition is one of the major causes of wind turbine related noise complaints for residents within 3 km (1.86 miles) of a wind farm. When the turbines are producing high sound levels, it is quiet outside the surrounding homes. The PhD thesis of G.P. van den Berg, *The Sounds of High Winds*, is very enlightening on this issue (Table 3). See also the letter by John Harrison in Ontario "On Wind Turbine Guidelines.[28]"

What sound monitor measurements would be needed for enforcement of the wind turbine sound ordinance? A similar set of sound tests using the ten (10) minute series of measurements would be repeated, with and without the operation of the wind turbines, at the location where noise was measured before construction, which is closest to the resident registering the wind turbine noise complaint. If the nighttime background (L_{90}) noise level (turbines off) was found to be slightly higher than the measured background prior to the wind farm installation, then the results with the turbines operating must be corrected using standard acoustical engineering methods to determine compliance with the pre-turbine established sound limits.

Who should conduct the sound measurements? An independent acoustics expert should be retained who reports to the County Board or other responsible governing body. This independent acoustics expert should be responsible for all the acoustic measurements including setup and calibration of instruments and interpretation of recorded results. He or she should perform all pre-turbine background noise measurements and interpretation of results to establish the nighttime (and daytime, if applicable) industrial wind turbine sound immission limits, and to monitor compliance.

At present, the acoustical consultants are retained by, and work directly for, the wind farm developers. This presents a serious problem with conflict of interest on the part of the consultants. The wind farm developer would like to show that a significant amount of wind noise is present to mask the sounds of the wind turbine immissions. The community is looking for authentic results showing that the wind turbine noise will be only barely perceptible, and then only occasionally, during the night or daytime.

Is frequency analysis required either during the pre-construction background noise survey or for compliance measurements? Normally one-third octave or narrower band analysis would only be required if there is a complaint of tones immission from the wind farm. Although only standardized dBA and dBC measurements are required to meet the proposed criteria, the addition of one-third octave band analysis is often useful to validate the dBA and dBC results.

The following summarizes the criteria necessary when siting wind turbines to minimize the risk of adverse impacts from noise on the adjacent community[29]. For those not familiar with acoustical annotation the table and its formulas may seem overly complex, but the criteria are defined in this manner to be as unambiguous as possible. They will be clear for those who are familiar with acoustical terminology. Definitions are provided in a later section of this essay.

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[28] Harrison, J., *Wind Turbine Guidelines*, available at http://amherstislandwindinfo.com/

[29] The authors have based these criteria, procedures, and language on their current understanding of wind turbine sound emissions, land-use compatibility, and the effects of sound on health. However, use of the following, in part or total, by any party is strictly voluntary and the user assumes all risks. Please seek professional assistance in applying the recommendations of this document to any specific community or WES development.

NOISE CRITERIA FOR SITING WIND TURBINES TO PREVENT HEALTH RISKS[30]

1. Establishing Long-Term Background Noise Level

a. Instrumentation: ANSI or IEC Type 1 Precision Integrating Sound Level Meter plus meteorological instruments to measure wind velocity, temperature and humidity near the sound measuring microphone. Measurement procedures must meet ANSI S12.9, Part 3 except as noted in Section 4, below.

b. Measurement location(s): Nearest property line(s) from proposed wind turbines representative of all non-participating residential property within 2.0 miles.

c. Time of measurements and prevailing weather: The atmosphere must be classified as stable with no vertical heat flow to cause air mixing. Stable conditions occur in the evening and middle of the night with a clear sky and very little wind near the surface. Sound measurements are only valid when the measured wind speed at the microphone is less than 2 m/s (4.5 mph).

d. Long-Term Background sound measurements: All data recording shall be a series of contiguous ten (10) minute measurements. The measurement objective is to determine the quietest ten minute period at each location of interest. Nighttime test periods are preferred unless daytime conditions are quieter. The following data shall be recorded simultaneously for each ten (10) minute measurement period: dBA data includes L_{A10}, L_{A90}, L_{Aeq} and dBC data includes L_{C10}, L_{C90} and L_{Ceq}. Record the maximum wind speed at the microphone during the ten minutes, a single measurement of temperature and humidity at the microphone for each new location or each hour whichever is oftener shall also be recorded. A ten (10) minute measurement contains valid data provided: Both L_{A10} minus L_{A90} and L_{C10} minus L_{C90} are not greater than 10 dB and the maximum wind speed at the microphone is less than 2 m/s during the same ten (10) minute period as the acoustic data.

2. Wind Turbine Sound Immission Limits

No wind turbine or group of turbines shall be located so as to cause wind turbine sound immission at any location on non-participating property containing a residence in excess of the limits in the following table:

Table of Not-To-Exceed Property Line Sound Immission Limits [1]			
Criteria	**Condition**	**dBA**	**dBC**
A	Immission above pre-construction background	$L_{Aeq} = L_{A90} + 5$	$L_{Ceq} = L_{C90} + 5$
B	Maximum immission:	35 L_{Aeq}	55 L_{Ceq} for quiet[2] rural environment 60 L_{Ceq} for rural-suburban environment
C	Immission spectra imbalance	L_{Ceq} (immission) minus (L_{A90} (background) +5) $\leq$ 20 dB	
D	Prominent tone penalty:	5 dB	5 dB
Notes			
1	Each Test is independent and exceedances of any test establishes non-compliance. Sound "immission" is the wind turbine noise emission as received at a property.		
2	A "Quiet rural environment" is a location >2 miles from a major transportation artery without high traffic volume during otherwise quiet periods of the day or night.		
3	Prominent tone as defined in IEC 61400-11. This Standard is not to be used for any other purpose.		
[1] Procedures provided in Section 7. Measurement Procedures (ANSI 12.9 Part 3 with Amendments) of the most recent version of **"The How To Guide To Siting Wind Turbines To Prevent Health Risks From Sound"** by Kamperman and James and the apply to this table.			

3. Wind Farm Noise Compliance Testing

All of the measurements outlined above in 1. Establishing Nighttime Background Noise Level must be repeated to determine compliance with 2. Wind Turbine Sound Immission Limits. The compliance test location is to be the pre-turbine background noise measurement location nearest to the home of the complainant in line with the wind farm and nearer to the wind farm. The time of day for the testing and the wind farm operating conditions plus wind speed and direction must replicate the conditions that generated the complaint. Procedures of ANSI S12.9- Part 3 apply except as noted in Section 4. The effect of instrumentation limits for wind and other factors must be recognized and followed.

4. ANSI S12.9 Part 3 Selected Options and Requirement Amendments

For measurements taken to assess the preceding criteria specific options provided for in ANSI S12.9-Part 3 (2008) shall be followed along with any additional requirements included below:

5.2 Background Sound: Use definition (1): 'long-term'

5.2 long-term background sound: The L_{90} excludes short term background sounds

5.3 basic measurement period: Ten (10) minutes $L_{90(10 min)}$

5.6 Sound Measuring Instrument: Type 1 Precision meeting ANSI S1.43 or IEC 61672-1. The sound level meter shall cover the frequency range from 6.3 Hz to 20k Hz and simultaneously measure dBA L_{eq} and dBC L_{eq}. The instrument must also be capable of accurately measuring low-level background sounds down to 20 dBA.

6.5 Windscreen: Required

6.6(a) An anemometer accurate to ± 10% at 2m/s to full-scale accuracy. The anemometer shall be located 1.5 to 2 meters above the ground and orientated to record maximum wind velocity. The maximum wind velocity, wind direction, temperature and humidity shall be recorded for each ten (10) minute sound measurement period observed within 5 m. of the measuring microphone.

7.1 Long-term background sound

7.2 Data collection Methods: Second method with observed samples to avoid contamination by short term sounds (purpose: to avoid loss of statistical data)

8. Source(s) Data Collection: All requirements in ANSI S12.18 Method #2, Precision to the extent possible while still permitting testing of the conditions that lead to complaints. The meteorological requirements in ANSI S12.18 may not be applicable for some complaint tests. For sound measurements in response to a complaint, the compliance sound measurements should be made under conditions that replicate the conditions that caused the complaint without exceeding instrument and windscreen limits and tolerances.

8.1(b) Measuring microphone with windscreen shall be located 1.2m to 1.8m (1.5 preferred) above the ground and greater than 8 m. from large sound reflecting surface.

8.3(a) All meteorological observations required at both (not either) microphone and nearest 10 m. weather reporting station.

8.3(b) For a ten (10) minute background sound measurement to be valid the wind velocity shall be less then 2m/s (4.5 mph) measured less than 5 m. from the microphone. Compliance sound measurements shall be taken when winds are less than 4m/s at the microphone.

8.3(c) In addition to the required acoustic calibration checks, the sound measuring instrument internal noise floor, including microphone, must also be checked at the end of each series of ten minute measurements and no less frequently than once per day. Insert the microphone into the acoustic calibrator with the calibrator signal off. Record the observed dBA and dBC reading on the sound level meter to determine an approximation of the instrument self noise. Perform this test before leaving the background measurement location. The calibrator-covered microphone must demonstrate the results of this test are at least 5 dB below the immediately previous ten (10) minute acoustic test results, for the acoustic background data to be valid. This test is necessary to detect undesired increase in the microphone and sound level meter internal self-noise. As a precaution sound measuring instrumentation should be removed from any air conditioned space at least an hour before use. Nighttime measurements are often performed very near the meteorological dew point. Minor moisture condensation inside a microphone or sound level meter can increase the instrument self noise and void the measured background data.

8.4 The remaining sections, starting at 8.4 in ANSI S12.9 Part 3 Standard do not apply.

V. How to Include the Recommended Criteria in Ordinances and/or Community Noise Limits

The following two sections present the definitions, technical requirements, and complaint resolution processes that support the recommended criteria. Following the formal elements is a section discussing the measurement procedures and requirements for enforcement of these criteria. For the purpose of the following sections the government authority will be referred to as the Local Government Authority (LGA) as a place marker for State, County, Township or other authorized authority. The abbreviation 'WES' is used for industrial scale wind energy system.

The authors have based these criteria, procedures, and language on their current understanding of wind turbine sound emissions, land-use compatibility, and the effects of sound on health. However, use of the following, in part or total, by any party is strictly voluntary and the user assumes all risks. Please seek professional assistance in applying the recommendations of this document to any specific community or WES development.

VI. ELEMENTS OF A WIND ENERGY SYSTEMS LICENSING ORDINANCE FOR SOUND

I. Purpose and Intent.

Based upon the findings stated above, it is the intended purpose of the LGA to regulate Wind Energy Systems to promote the health, safety, and general welfare of the citizens of the Town and to establish reasonable and uniform regulations for the operation thereof so as to control potentially dangerous effects of these Systems on the community.

II. Definitions.

The following terms have the meanings indicated:

"Acrodynamic Sound" means a noise that is caused by the flow of air over and past the blades of a WES.

"Ambient Sound" Ambient sound encompasses all sound present in a given environment, being usually a composite of sounds from many sources near and far. It includes intermittent noise events, such as, from aircraft flying over, dogs barking, wind gusts, mobile farm or construction machinery, and the occasional vehicle traveling along a nearby road. The ambient also includes insect and other nearby sounds from birds and animals or people. The near-by and transient events are part of the ambient sound environment but are not to be considered part of the long-term background sound.

"American National Standards Institute (ANSI)" Standardized acoustical instrumentation and sound measurement protocol shall meet all the requirements of the following ANSI Standards:

ANSI S1.43 Integrating Averaging Sound Level Meters: Type-1 (or IEC 61672-1)

ANSI S1.11 Specification for Octave and One-third Octave-Band Filters (or IEC 61260)

ANSI S1.40 Verification Procedures for Sound Calibrators

ANSI S12.9 Part 3 Procedures for Measurement of Environmental Sound

ANSI S12.18 Measurement of Outdoor Sound Pressure Level

IEC 61400-11 Wind turbine generator systems –Part 11: Acoustic noise measurements

"Anemometer" means a device for measuring the speed and direction of the wind.

"Applicant" means the individual or business entity that seeks to secure a license under this section of the Town municipal code.

"A-Weighted Sound Level (dBA)" A measure of over-all sound pressure level designed to reflect the response of the human ear, which does not respond equally to all frequencies. It is used to describe sound in a manner representative of the human ear's response. It reduces the effects of the low with respect to the frequencies centered around 1000 Hz. The resultant sound level is said to be "A-weighted" and the units are "dBA." Sound level meters have an A-weighting network for measuring A-weighted sound levels (dBA) meeting the characteristics and weighting specified in ANSI Specifications for Integrating Averaging Sound Level Meters, S1.43-1997 for Type 1 instruments and be capable of accurate readings (corrections for internal noise and microphone response permitted) at 20 dBA or lower. In this document dBA means L_{Aeq} unless specified otherwise.

"Background Sound (L_{90})" refers to the sound level present at least 90% of the time. Background sounds are those heard during lulls in the ambient sound environment. That is, when transient sounds from flora, fauna, and wind are not present. Background sound levels vary during different times of the day and night. Because WES operates 24/7 the background sound levels of interest are those during the quieter periods which are often the evening and night. Sounds from the WES of interest, near-by birds and animals or people must be excluded from the background sound test data. Nearby electrical noise from streetlights, transformers and cycling AC units and pumps etc must also be excluded from the background sound test data.

Background sound level (dBA and dBC (as L_{90})) is the sound level present 90% of the time during a period of observation that is representative of the quiet time for the soundscape under evaluation and with duration of ten (10) continuous minutes. Several contiguous ten (10) minute tests may be performed in one hour to determine the statistical stability of the sound environment. Measurement periods such as at dusk when bird and insect activity is high or the early morning hours when the 'dawn chorus' is present are not acceptable measurement times. Longer term sound level averaging tests, such as 24 hours or multiple days are not at all appropriate since the purpose is to define the quiet time background sound level. It is defined by the L_{A90} and L_{C90} descriptors. It may be considered as the quietest one (1) minute during a ten (10) minute test. L_{A90} results are valid only when L_{A10} results are no more than 10 dB above L_{A90} for the same period. L_{C10} less L_{C90} are not to exceed 10 dB to be valid.

The background noise environment consists of a multitude of distant sources of sound. When a new nearby source is introduced the new background noise level would be increased. The addition of a new source with a noise level 10 below the existing background would increase the new background 0.4 dB. If the new source has the same noise level as the existing background then the new background is increased 3.0 dB. Lastly, if the new source is 3.3 dB above the existing background then the new background would have increased 5 dB. For example, to meet the requirement of L_{90A} + 5 dB = 31 dBA if the existing quiet nighttime background sound level is 26 dBA, the maximum wind turbine noise immission contribution independent of the background cannot exceed 29.3 dBA L_{eq} at a dwelling. When adding decibels, a 26 dBA background combined with 29.3 dBA from the turbines (without background) results in 31 dBA.

Further, background L_{90} sound levels documenting the pre-construction baseline conditions should be determined when the ten (10) minute maximum wind speed is less than 2 m/s (4.5 mph) near ground level/microphone location 1.5 m height.

"Blade Passage Frequency" (BPF) means the frequency at which the blades of a turbine pass a particular point during each revolution (e.g. lowest point or highest point in rotation) in terms of

events per second. A three bladed turbine rotating at 28 rpm would have a BPF of 1.4 Hz. [E.g. ((3 blades times 28rpm)/60 seconds per minute = 1.4 Hz BPF)]

"C-Weighted Sound Level (dBC)" Similar in concept to the A-Weighted sound Level (dBA) but C-weighting does not de-emphasize the frequencies below 1k Hz as A-weighting does. It is used for measurements that must include the contribution of low frequencies in a single number representing the entire frequency spectrum. Sound level meters have a C-weighting network for measuring C-weighted sound levels (dBC)meeting the characteristics and weighting specified in ANSI S1.43-1997 Specifications for Integrating Averaging Sound Level Meters for Type 1 instruments. In this document dBC means L_{Ceq} unless specified otherwise.

"Decibel (dB)" A dimensionless unit which denotes the ratio between two quantities that are proportional to power, energy or intensity. One of these quantities is a designated reference by which all other quantities of identical units are divided. The sound pressure level (Lp) in decibels is equal to 10 times the logarithm (to the base 10) of the ratio between the pressure squared divided by the reference pressure squared. The reference pressure used in acoustics is 20 MicroPascals.

"Emission" Sound energy that is emitted by a noise source (wind farm) is transmitted to a receiver (dwelling) where it is immitted (see "immission).

"Frequency" The number of oscillations or cycles per unit of time. Acoustical frequency is usually expressed in units of Hertz (Hz) where one Hz is equal to one cycle per second.

"Height" means the total distance measured from the grade of the property as existed prior to the construction of the wind energy system, facility, tower, turbine, or related facility at the base to its highest point.

"Hertz (Hz)" Frequency of sound expressed by cycles per second.

"Immission" Noise immitted at a receiver (dwelling) is transmitted from noise source (wind turbine) that emitted sound energy (see "emission").

"Immission spectra imbalance" The spectra are not in balance when the C-weighted sound level is more than 20 dB greater than the A-weighted sound level. For the purposes of this requirement, the A-weighted sound level is defined as the long-term background sound level (L_{A90}) +5 dBA. The C-weighted sound level is defined as the L_{Ceq} measured during the operation of the wind turbine operated so as to result in its highest sound output. A Complaint test provided later in this document is based on the immission spectra imbalance criteria.

"Infra-Sound" sound with energy in the frequency range of 0-20 Hz is considered to be infra-sound. It is normally considered to not be audible for most people unless in relatively high amplitude. However, there is a wide range between the most sensitive and least sensitive people to perception of sound and perception is not limited to stimulus of the auditory senses. The most significant exterior noise induced dwelling vibration occurs in the frequency range between 5 Hz and 50 Hz. Moreover, levels below the threshold of audibility can still cause measurable resonances inside dwelling interiors. Conditions that support or magnify resonance may also exist in human body cavities and organs under certain conditions. Although no specific test for infrasound is provided in this document, the test for immission spectra imbalance will limit low frequency sound and thus, indirectly limit infrasound. See low-frequency noise (LFN) for more information.

"Low Frequency Noise (LFN)" refers to sounds with energy in the lower frequency range of 20 to 200 Hz. LFN is deemed to be excessive when the difference between a C-weighted sound level and an A-weighted sound level is greater than 20 decibels at any measurement point outside a residence or other occupied structure. The criteria for this condition is the "Immission Spectra Imbalance" entry in the **Table of Not-To-Exceed Property Line Sound Immission Limits**."

"**Measurement Point (MP)**" means location where sound measurements are taken such that no significant obstruction blocks sound from the site. The Measurement Point should be located so as to not be near large objects such as buildings and in the line-of-sight to the nearest turbines. Proximity to large buildings or other structures should be twice the largest dimension of the structure, if possible. Measurement Points should be at quiet locations remote from street lights, transformers, street traffic, flowing water and other local noise sources.

"**Measurement Wind Speed**" For measurements conducted to establish the background noise levels ($L_{A90\ 10\ min}$, $L_{C90\ 10\ min}$ and etc.) the maximum wind speed, sampled within 5m of the microphone and at its height, shall be less than 2 m/s (4.5 mph) for valid background measurements. For valid wind farm noises measurements conducted to establish the post-construction sound level the maximum wind speed, sampled within 5m of the microphone and at its height, shall be less than 4m/s (9 mph). The wind speed at the WES blade height shall be at or above the nominal rated wind speed and operating in its highest sound output mode. For purposes of enforcement, the wind speed and direction at the WES blade height shall be selected to reproduce the conditions leading to the enforcement action while also restricting maximum wind speeds at the microphone to less than 4 m/s (9 mph).

For purposes of models used to predict the sound levels and sound pressure levels of the WES to be submitted with the Application, the wind speed shall be the speed that will result in the worst-case L_{Aeq} and L_{Ceq} sound levels at the nearest non-participating properties to the WES. If there may be more than one set of nearby sensitive receptors, models for each such condition shall be evaluated and the results shall be included in the Application.

"**Mechanical Noise**" means sound produced as a byproduct of the operation of the mechanical components of a WES(s) such as the gearbox, generator and transformers.

"**Noise**" means any unwanted sound. Not all noise needs to be excessively loud to represent an annoyance or interference.

"**Project Boundary**" means the external property boundaries of parcels owned by or leased by the WES developers. It is represented on a plot plan view by a continuous line encompassing all WES(s) and related equipment associated with the WES project.

"**Property Line**" means the recognized and mapped property parcel boundary line

"**Qualified Independent Acoustical Consultant**" Qualifications for persons conducting baseline and other measurements and reviews related to the application for a WES or for enforcement actions against an operating WES include, at a minimum, demonstration of competence in the specialty of community noise testing. An example is a person with Full Membership in the Institute of Noise Control Engineers (INCE). There are scientists and engineers in other professional fields that have been called upon by their local community for help in the development of a WES Noise Ordinance. Many of these scientists and engineers have recently spent hundreds of hours learning many important aspects of noise related to the introduction of WES into their communities. Then with field measurement experience with background data and wind turbine noise emission, they have become qualified independent acoustical consultants for WES siting. Certifications such as Professional Engineer (P.E.) do not test for competence in acoustical principles and measurement and are thus not, without further qualification, appropriate for work under this document. The Independent Qualified Acoustical Consultant can have no financial or other connection to a WES developer or related company.

"**Sensitive Receptor**" means places or structures intended for human habitation, whether inhabited or not, public parks, state and federal wildlife areas, the manicured areas of recreational establishments designed for public use, including but not limited to golf courses, camp grounds and other nonagricultural state or federal licensed businesses. These areas are more likely to be sensitive to the exposure of the noise, shadow or flicker, etc. generated by a WES or WESF. These areas include, but are not limited to: schools, daycare centers, elder care facilities, hospitals, places of seated assemblage, non-agricultural businesses and residences.

"**Sound**" A fluctuation of air pressure which is propagated as a wave through air

"**Sound Power**" The total sound energy radiated by a source per unit time. The unit of measurement is the watt. Abbreviated as L_w. This information is determined for the WES manufacturer under laboratory conditions specified by IEC 61400-11 and provided to the local developer for use in computer model construction. There is known measurement error in this test procedure that must be disclosed and accounted for in the computer models. Even with the measurement error correction it cannot be assumed that the reported L_w values represent the highest sound output for all operating conditions. They reflect the operating conditions required to meet the IEC 61400-11 requirements. The lowest frequency is 50 Hz for acoustic power (L_w) requirement (at present) in IEC 61400-11. This Ordinance requires wind turbine certified acoustic power (L_w) levels at rated load for the total frequency range from 6.3 Hz to 10k Hz in one-third octave frequency bands tabulated to the nearest 1 dB. The frequency range of 6.3 Hz to 10k Hz shall be used throughout this Ordinance for all sound level modeling, measuring and reporting.

"**Sound Pressure**" The instantaneous difference between the actual pressure produced by a sound wave and the average or barometric pressure at a given point in space.

"**Sound Pressure Level (SPL)**" 20 times the logarithm, to the base 10, of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micronewtons per square meter. In equation form, sound pressure level in units of decibels is expressed as SPL (dB) = 20 log p/pr.

"**Spectrum**" The description of a sound wave's resolution into its components of frequency and amplitude. The WES manufacturer is required to supply a one-third octave band frequency spectrum of the wind turbine sound emission at 90% of rated power. The published sound spectrum is often presented as A-weighted values but C-weighted values are preferred. This information is used to construct a model of the wind farm's sound immission levels at locations of interest in and around the WES. The frequency range of interest for wind turbine noise is approximately 6 Hz to 10k Hz.

"**Statistical Noise Levels**" Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels L_{AN}, where L_{AN} is the A-weighted sound level exceeded for N% of a given measurement period. For example, L_{A10} is the noise level exceeded for 10% of the time. Of particular relevance, are: L_{A10} and L_{C10} the noise level exceed for 10% of the ten (10) minute interval. This is commonly referred to as the average maximum noise level. L_{A90} and L_{C90} are the A-weighted and C-weighted sound levels exceeded for 90% of the ten (10) minute sample period. The L_{90} noise level is defined by ANSI as the long-term background sound level (i.e. the sounds one hears in the absence of the noise source under consideration and without short term or near-by sounds from other sources), or simply the "background level." L_{eq} is the A or C-weighted equivalent noise level (the "average" noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound

"**Tonal sound or tonality**" Tonal audibility. A sound for which the sound pressure is a simple sinusoidal function of the time, and characterized by its singleness of pitch. Tonal sound can be simple or complex.

"**Wind Energy Systems (WES)**" means equipment that converts and then transfers energy from the wind into usable forms of electrical energy.

"**Wind Turbine" or "Turbine" (WT)** means an industrial scale mechanical device which captures the kinetic energy of the wind and converts it into electricity. The primary components of a wind turbine are the blade assembly, electrical generator and tower.

III. APPLICATION PROCEDURE FOR WIND ENERGY SYSTEMS AND TECHNICAL REQUIREMENTS FOR LICENSING

This ordinance is intended to promote the safety and health of the community through criteria limiting sound emissions during operation of Wind Energy Systems. It is recognized that the requirements herein are neither exclusive, nor exhaustive. In instances where a health or safety concern is known to the wind project developer or identified by other means with regard to any application for a Wind Energy System, additional and/or more restrictive conditions may be included in the license to address such concerns. All rights are reserved to impose additional restrictions as circumstances warrant. Such additional or more restrictive conditions may include, without limitation (a) greater setbacks, (b) more restrictive noise limitations, or (c) limits restricting operation during night time periods or for any other conditions deemed reasonable to protect the community.

A. Application

Any Person desiring to secure a Wind Energy Systems license shall file an application form provided by the LGA Clerk, together with two additional copies of the application with the LGA Clerk.

B. Information to be submitted with Application

1. Information regarding the:

- Make and model of all turbines potentially used in this project.
- Sound Power Levels (L_w) for each 1/3 octave band from 6.3 Hz to 10,000 Hz, and
- A sound propagation model predicting the sound levels immitted into the community computed using at minimum 1/1 octave band sound power levels to compute the L_{Ceq} and L_{Aeq} levels to generate L_{Aeq} and L_{Ceq} contours in 5 dB increments overlaying an aerial view and property survey map from the WES property out to a distance to include all residential property within two (2) miles of the WES Property. Appropriate corrections for model algorithm error, IEC61400-11 test measurement accuracy, and directivity patterns of for each model of WT shall be disclosed and accounted for in the model(s). Predictions shall be made at all property lines within and outward for two (2) miles from the project boundary for the wind speed, direction and operating mode that would result in the worst case WT nighttime sound emissions.

The prediction model shall assume that the winds at hub height are sufficient for the highest sound emission operating mode. The projection shall include a description of all assumptions made in the model's construction and algorithms. If the model does not consider the effects of wind direction, geography of the terrain, and/or the effects of reinforcement from coherent sounds or tones from

the turbines all these items should be identified and all other means used to adjust the model's output to account for these factors. The results shall be displayed as a contour map of the predicted levels as over-all L_{Aeq} and L_{Ceq} contours out to 2 miles from the WES property, and shall also include a table showing the 1/3 or 1/1 octave band sound pressure as L_{Ceq} levels for the nearest property line(s) for sensitive receptor sites (including residences) within the model's boundaries. The predicted values must include the over-all sound levels and 1/1 or 1/3 octave band sound pressure levels from 6 Hz to 10k Hz in data tables that include the location of each receiving point by GPS location or other repeatable means.

C. Preconstruction Background Noise Survey

1. The Town reserves the right to require the preparation of (a) a preconstruction noise survey for each proposed Wind Turbine location conducted per procedures provided in the section on Measurement Procedures showing long-term background L_{A90} and L_{C90} sound levels. This must be completed and accepted prior to approval of the final layout and issuance of project permits.

   a. If any proposed wind farm project locates a WES within two miles of a sensitive receptor these studies are mandatory. The preconstruction baseline studies shall be conducted by an Independent Qualified Acoustical Consultant selected and hired by the LGA.

   b. The applicant shall be responsible for paying the consultant's fees and costs associated with conducting the study. These fees and cost shall be negotiated with the consultant and determined prior to any work being done on the study. The applicant shall be required to set aside 100% of these fees in an escrow account managed by the LGA, before the study is commenced by the consultant. Payment for this study does not require the WES developer's acceptance of the study's results.

   c. If the review shows that the predicted L_{Aeq} and L_{Ceq} sound levels exceed any of the criteria specified in the **Table of Not-To-Exceed Property Line Sound Immission Limits** then the application cannot be approved.

2. The LGA will refer the application to the LGA engineer (if qualified in acoustics) or an independent qualified acoustical consultant for further review and comparison of the long-term background sound levels against the predicted L_{Aeq} and L_{Ceq} sound levels reported for the model using the criteria in the **Table of Not-To-Exceed Property Line Sound Immission Limits**. The reasonably necessary costs associated with such a review shall be the responsibility of the applicant, in accord with the terms of this ordinance.

D. Post Construction Noise Measurement Requirements

1. **Sound Regulations Compliance**. A WES shall be considered in violation of the conditional use permit unless the applicant demonstrates that the project complies with all sound level limits using the procedures specified in this ordinance. Sound levels in excess of the limits established in this ordinance shall be grounds for the LGA to order immediate shut down of all non-compliant WT units.

2. **Post-Construction Sound Measurements**: Within twelve months of the date when the project is fully operational, and within four weeks of the anniversary date of the pre-construction background noise measurements, repeat the existing sound environment measurements taken before the project approval. Post-construction sound level measurements shall be taken both with all WES's running and with all WES's off. At the discretion of the Town, the Pre-construction background sound levels (L_{A90} and L_{C90}) can be substituted for the "all WES off" tests if a random sampling of 10% of the pre-construction study sites shows that background L_{A90} and L_{C90} conditions have increased less than 3 dB from those measured under the pre-

construction nighttime conditions. The post-construction measurements will be reported to the LGA (available for public review) using the same format as used for the preconstruction sound studies. Post-construction noise studies shall be conducted by a firm chosen and hired by the LGA. Costs of these studies are to be reimbursed by the Licensee in a similar manner to that described above. The wind farm developer's may ask to have its own consultant observe the publicly retained consultant at the convenience of the latter. The WES Licensee shall provide all technical information and wind farm data required by the qualified independent acoustical consultant before, during, and/or after any acoustical studies required by this document and for acoustical measurements.

3. Sound Limits

1. Establishing Long-Term Background Sound Level

a. Instrumentation: ANSI or IEC Type 1 Precision Integrating Sound Level Meter plus meteorological instruments to measure wind velocity, temperature and humidity near the sound measuring microphone. Measurement procedures must meet ANSI S12.9, Part 3 and Measurement Procedures Appendix to Ordinance following next Section.

b. Measurement location(s): Nearest property line(s) from proposed wind turbines representative of all non-participating residential property within 2.0 miles.

c. Time of measurements and prevailing weather: The atmosphere must be classified as stable with no vertical heat flow to cause air mixing. Stable conditions occur in the evening and middle of the night with a clear sky and very little wind near the surface. Sound measurements are only valid when the measured maximum wind speed at the microphone must be less than 2 m/s (4.5 mph).

d. Long-Term Background sound measurements: All data recording shall be a series of contiguous ten (10) minute measurements. The measurement objective is to determine the quietest ten minute period at each location of interest. Nighttime test periods are preferred unless daytime conditions are quieter. The following data shall be recorded simultaneously for each ten (10) minute measurement period: dBA data includes L_{A10}, L_{A90}, L_{Aeq} and dBC data includes L_{C10}, L_{C90} and L_{Ceq}. The maximum wind speed at the microphone during the ten minutes, a single measurement of temperature and humidity at the microphone for each new location or each hour whichever is oftener shall also be recorded. A ten (10) minute measurement contains valid data provided: Both L_{A10} minus L_{A90} and L_{C10} minus L_{C90} are not greater than 10 dB and the maximum wind speed at the microphone is less than 2 m/s during the same ten (10) minute period as the acoustic data.

2. Wind Turbine Sound Immission Limits

No wind turbine or group of turbines shall be located so as to cause wind turbine sound immission at any location on non-participating property containing a residence in excess of the limits in the following table:

Table of Not-To-Exceed Property Line Sound Immission Limits [1]

Criteria	Condition	dBA	dBC
A	Immission above pre-construction background	$L_{Aeq} > L_{A90} + 5$	$L_{Ceq} > L_{C90} + 5$
B	Maximum immission:	35 L_{Aeq}	55 L_{Ceq} for quiet[2] rural environment 60 L_{Ceq} for rural-suburban environment
C	Immission spectra imbalance ($C - A \leq 20$dB)	L_{Ceq} (immission) minus (L_{A90} (background) +5 dB) $\leq$ 20 dB	
D	Prominent tone penalty:	5 dB	5 dB

Notes	
1	Each Test is independent and exceedances of any test establishes non-compliance. Sound "immission" is the wind turbine sound emission as received at a property.
2	A "quiet rural environment" is a location 2 miles from a major transportation artery without high traffic volume during otherwise quiet periods of the day or night.
3	Prominent tone as defined in IEC 61400-11. This Standard is not to be used for any other purpose

[1] Required Procedures provided in VIII Reference Standards including ANSI 12.9 Part 3 as Amended

3. Wind Farm Noise Compliance Testing

All of the measurements outlined above in 1. Establishing Long Term Background Noise Level must be repeated to determine compliance with 2. Wind Turbine Sound Immission Limits. The compliance test location is to be the pre-turbine background noise measurement location nearest to the home of the complainant in line with the wind farm and nearer to the wind farm. The time of day for the testing and the wind farm operating conditions plus wind speed and direction must replicate the conditions that generated the complaint. Procedures of ANSI S12.9- Part 3 apply as amended in the Appendix to Ordinance. The effect of instrumentation limits for wind and other factors must be recognized and followed.

3. Operations

The WES/WT is non-compliant and must be shut down immediately if it exceeds any of the limits in the **Table of Not-To-Exceed Property Line Sound Immission Limits.**

4. Complaint Resolution

1. The owner/operator of the WES shall respond within five (5) business days after notified of a noise complaint by any property owner within the project boundary and a one-mile radius beyond the project boundary.
2. The tests shall be performed by a qualified independent acoustical consultant acceptable to the complainant and the local agency charged with enforcement of this ordinance.
3. Testing shall commence within ten (10) working days of the request. If testing cannot be initiated within ten (10) days, the WES(s) in question shall be shut down until the testing can be started.
4. A copy of the test results shall be sent to the property owner, and the LGA's Planning or Zoning department within thirty (30) days of test completion.
5. If a Complaint is made, the presumption shall be that it is reasonable. The LGA shall undertake an investigation of the alleged operational violation by a qualified individual mutually acceptable to the LGA.

a) The reasonable cost and fees incurred by the LGA in retaining said qualified individual shall be reimbursed by the owner of the WESF.

b) Funds for this assessment shall be paid or put into an escrow account prior to the study and payment shall be independent of the study findings.

6. After the investigation, if the LGA reasonably concludes that operational violations are shown to be caused by the WESF, the licensee/operator/owner shall use reasonable efforts to mitigate such problems on a case-by-case basis including such measures as not operating during the nighttime or other noise sensitive period if such operation was the cause of the complaints.

5. Reimbursement of Fees and Costs.

Licensee/operator/owner agrees to reimburse the LGA 's reasonable fees and costs incurred in the preparation, negotiation, administration and enforcement of this Ordinance, including, without limitation, the LGA 's attorneys' fees, engineering and/or consultant fees, LGA meeting and hearing fees and the costs of public notices. If requested by the LGA the funds shall be placed in an escrow account under the management of the LGA. The preceding fees are payable within thirty (30) days of invoice. Unpaid invoices shall bear interest at the rate of 1% per month until paid. The LGA may recover all reasonable costs of collection, including attorneys' fees.

VII. MEASUREMENT PROCEDURES

SUPPLEMENT TO WIND ENERGY SYSTEMS LICENSING ORDINANCE FOR SOUND

I. Introduction

The potential impact of sound and sound induced building vibration associated with the operation of wind powered electric generators is often a primary concern for citizens living near proposed wind energy systems (WES(s)). This is especially true of projects located near homes, residential neighborhoods, businesses, schools, and hospitals in quiet residential and rural communities. Determining the likely sound and vibration impacts is a highly technical undertaking and requires a serious effort in order to collect reliable and meaningful data for both the public and decision makers.

This protocol is based in part on criteria published in American National Standards S12.9 -Part 3 Quantities and Procedures for Description and Measurement of Environmental Sound, and S12.18 and for the measurement of sound pressure level outdoors.

The purpose is to first, establish a consistent and scientifically sound procedure for evaluating existing background levels of audible and low frequency sound in a WES project area, and second to use the information provided by the Applicant in its Application showing the predicted over-all sound levels in terms of L_{Aeq} and L_{Ceq} and 1/3 or 1/1 octave bands as part of the required information submitted with the application.

The over-all values shall be presented as overlays to the applicant's iso-level plot plan graphics and, for 1/1 or 1/3 octave data, in tabular form with location information sufficient to permit comparison of the baseline results to the predicted levels. This comparison will use the level limits of the ordinance to determine the likely impact operation of a new wind energy system project will have on the existing community soundscape. If the comparison demonstrates that the WES project will not exceed any of the level limits the project will be considered to be within allowable limits for safety and health. If the Applicant submits only partial information required for this comparison

the application cannot be approved. In all cases the burden to establish the operation as meeting safety and health limits will be on the Applicant.

Next, it covers requirements for the sound propagation model to be supplied with the application.

Finally, if the project is approved, this section covers the study needed to compare the post-build sound levels to the predictions and the baseline study. The level limits in the ordinance apply to the post-build study. In addition, if there have been any complaints about WES sound or low frequency noise emissions or wind turbine noise induced dwelling vibration by any resident of an occupied dwelling that property will be included in the post-build study for evaluation against the rules for sound level limits and compliance.

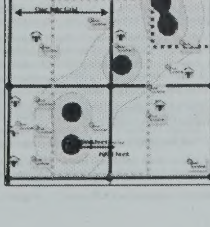
The characteristics of the proposed WES project and the features of the surrounding environment will influence the design of the sound and vibration study. Site layout, types of WES(s) selected and the existence of other significant local audible and low frequency sound sources and sensitive receptors should be taken into consideration when designing a sound study. The work will be performed by a qualified independent acoustical consultant for both the pre-construction background and post-construction sound studies as described in the body of the ordinance.

II. Instrumentation

All instruments and other tools used to measure audible, inaudible and low frequency sound shall meet the requirements for ANSI or IEC Type 1 Integrating Averaging Sound Level Meter Standards. The principle standard reference for this document is ANSI 12.9/Part 3 with important additional specific requirements for the measuring instrumentation and measurement protocol.

III. Measurement of Pre-Construction Sound Environment (Base-line)

An assessment of the proposed WES project areas existing sound environment is necessary in order to predict the likely impact resulting from a proposed project. The following guidelines must be used in developing a reasonable estimate of an area's existing background sound environment. All testing is to be performed by an independent qualified acoustical consultant approved by the LGA as provided in the body of the ordinance. The WES applicant may file objections detailing any concerns it may have with the LGA's selection. These concerns will be addressed in the study. Objections must be filed prior to the start of the noise study. All measurements are to be conducted with ANSI or IEC Type 1 certified and calibrated test equipment per reference specification at the end of this section. Test results will be reported to the LGA or its appointed representative.



Sites with No Existing Wind Energy Systems (Base-line Sound Study)

Sound level measurements shall be taken as follows:

The results of the model showing the predicted worst case L_{Aeq} and L_{Ceq} sound emissions of the proposed WES project will be overlaid on a map (or separate L_{Aeq} and L_{Ceq} maps) of the project area. An example (right) shows an approximately two (2) mile square section with iso-level contour lines prepared by the applicant, sensitive receptors (homes) and locations selected for the baseline sound tests whichever are the controlling metric. The test points shall be located at the property line bounding the property of the turbine's host closest to the wind turbine. Additional sites may be added if appropriate. A grid comprised of one (1) mile boundaries (each grid cell is one (1) square mile) should be used to assist in identifying between two (2) to ten (10) measurement points per cell. The grid shall extend to a minimum of two (2) miles beyond the perimeter of the project boundary. This may be extended to more than two (2) miles at the discretion of the LGA. The measurement points shall be selected to represent the noise sensitive receptor sites based on the anticipated sound propagation from the combined WT in the project. Usually, this will be the closest WT. If there is more than one WT near-by then more than one test site may be required.

The intent is to anticipate the locations along the bounding property line that will receive the highest sound immissions. The site that will most likely be negatively affected by the WES project's sound emissions should be given first priority in testing. These sites may include sites adjacent to occupied dwellings or other noise sensitive receptor sites. Sites shall be selected to represent the locations where the background soundscapes reflect the quietest locations of the sensitive receptor sites. Background sound levels (and 1/3 octave band sound pressure levels if required) shall be obtained according to the definitions and procedures provided in the ordinance and recognized acoustical testing practice and standards.

All properties within the proposed WES project boundaries will be considered for this study.

One test shall be conducted during the period defined by the months of April through November with the preferred time being the months of June through August. These months are normally associated with more contact with the outdoors and when homes may have open windows during the evening and night. Unless directed otherwise by the LGA the season chosen for testing will represent the background soundscape for other seasons. At the discretion of the LGA, tests may be scheduled for other seasons.

All measurement points (MPs) shall be located with assistance from the LGA staff and property owner(s) and positioned such that no significant obstruction (building, trees, etc.) blocks sound and vibration from the nearest proposed WES site.

Duration of measurements shall be a minimum of ten (10) continuous minutes for all criteria at each location. The duration must include at least six (6) minutes that are not affected by transient sounds from near-by and non-nature sources. Multiple ten (10) minute samples over longer periods such as 30 minutes or one (1) hour may be used to improve the reliability of the L_{A90} and L_{C90} values. The ten (10) minute sample with the lowest valid L_{90} values will be used to define the background sound.

The tests at each site selected for this study shall be taken during the expected 'quietest period of the day or night' as appropriate for the site. For the purpose of determining background sound characteristics the preferred testing time is from 10pm until 4 am. If circumstances indicated that a different time of the day should be sampled the test may be conducted at the alternate time if approved by the Town.

Sound level measurements shall be made on a weekday of a non-holiday week. Weekend measurements may also be taken at selected sites where there are weekend activities that may be affected by WT sound.

Measurements must be taken with the microphone at 1.2 to 1.5 meters above the ground and at least 15 feet from any reflective surface following ANSI 12.9 Part 3 protocol including selected options and other requirements outlined later in this Section.

Reporting

1. For each Measurement Point and for each qualified measurement period, provide each of the following measurements:

a. L_{Aeq}, L_{A10} and L_{A90} and

b. L_{Ceq}, L_{C10} and L_{C90}

2. A narrative description of any intermittent sounds registered during each measurement. This may be augmented with video and audio recordings.

3. A narrative description of the steady sounds that form the background soundscape. This may be augmented with video and audio recordings.

4. Wind speed and direction at the microphone (Measurement Point), humidity and temperature at time of measurement will be included in the documentation. Corresponding information from the nearest 10 meter weather reporting station shall also be obtained.

Measurements taken only when wind speeds are less than 2m/s (4.5 mph) at the microphone location will be considered valid for this study. A windscreen of the type recommended by the monitoring instrument's manufacturer must be used for all data collection.

5. Provide a map and/or diagram clearly showing (Using plot plan provided by LGA or Applicant):

- The layout of the project area, including topography, the project boundary lines, and property lines.
- The locations of the Measurement Points.
- The distance between any Measurement Points and the nearest WT(s).
- The location of significant local non-WES sound and vibration sources.
- The distance between all MP's and significant local sound sources. And,
- The location of all sensitive receptors including but not limited to: schools, day-care centers, hospitals, residences, residential neighborhoods, places of worship, and elderly care facilities.

Sites with Existing Wind Energy Systems

Two complete sets of sound level measurements must be taken as defined below:

1. One set of measurements with the wind generator(s) off unless the LGA elects to substitute the sound data collected for the background sound study. Wind speeds must be suitable for background sound tests as specified elsewhere in this ordinance.

2. One set of measurements with the wind generator(s) running with wind speed at hub height sufficient to meet nominal rated power output or higher and less than 2 m/s below at the microphone location. Conditions should reflect the worst case sound emissions from the WES project. This will normally involve tests taken during the evening or night when winds are calm (less than 2m/sec) at the ground surface yet, at hub height, sufficient to power the turbines.

Sound level measurements and meteorological conditions at the microphone shall be taken and documented as discussed above.

Sound level Estimate for Proposed Wind Energy Systems (when adding more WT to existing project)

In order to estimate the sound impact of the proposed WES project on the existing environment an estimate of the sound produced by the proposed WES(s) under worst-case conditions for producing sound emissions must be provided. This study may be conducted by a firm chosen by the WES operator with oversight provided by the LGA.

The qualifications of the firm should be presented along with details of the procedure that will be used, software applications, and any limitations to the software or prediction methods as required elsewhere in this ordinance for models.

Provide the manufacturer's sound power level (L_{WA}) and (L_{WC}) characteristics for the proposed WES(s) operating at full load utilizing the methodology in IEC 61400-11 Wind Turbine Noise Standard. Provide one-third octave band sound power level information from 6.3 Hz to 10k Hz. Furnish the data using no frequency weighting. A-weighted data is optional. Provide sound pressure levels predicted for the WES(s) in combination and at full operation and at maximum sound power output for all areas where the predictions indicate L_{Aeq} levels of 30 dBA and above. The same area shall be used for reporting the predicted L_{Ceq} levels. Contour lines shall be in increments of 5 dB.

Present tables with the predicted sound levels for the proposed WES(s) as L_{Aeq} and L_{Ceq} and at all octave band centers (8 Hz to 10k Hz) for distances of 500, 1000, 1500, 2000, 2500 and 5000 feet from the center of the area with the highest density of WES(s). For projects with multiple WES(s), the combined sound level impact for all WES(s) operating at full load must be estimated.

The above tables must include the impact (increased dBA and dBC (L_{eq}) above baseline L_{90} background sound levels) of the WES operations on all residential and other noise sensitive receiving locations within the project boundary. To the extent possible, the tables should include the sites tested (or likely to be tested) in the background study.

Provide a contour map of the expected sound level from the new WES(s), using 5dB L_{Aeq} and L_{Ceq} increments created by the proposed WES(s) extending out to a distance of two (2) miles from the project boundary, or other distance necessary, to show the 25 L_{Aeq} and 50 L_{Ceq} boundaries.

Provide a description of the impact of the proposed sound from the WES project on the existing environment. The results should anticipate the receptor sites that will be most negatively impacted by the WES project and to the extent possible provide data for each MP that are likely to be selected in the background sound study (note the sensitive receptor MPs):

1. Report expected changes to existing sound levels for L_{Aeq} and L_{A90}
2. Report expected changes to existing sound levels for L_{Ceq} and L_{C90}
3. Report the expected changes to existing sound pressure levels for each of the 1/1 or 1/3 octave bands in tabular form from 8 Hz to 10k Hz.
4. Report all assumptions made in arriving at the estimate of impact, any limitations that might cause the sound levels to exceed the values of the estimate, and any conclusions reached regarding the potential effects on people living near the project area. If the effects of coherence, worst case weather, or operating conditions are not reflected in the model a discussion of how these factors could increase the predicted values is required.
5. Include an estimate of the number of hours of operation expected from the proposed WES(s) and under what conditions the WES(s) would be expected to run. Any differences from the information filed with the Application should be addressed.

IV. Post-Construction Measurements

Post Construction Measurements should be conducted by a qualified noise consultant selected by and under the direction of the LGA. The requirements of this Appendix for Sites with Existing Wind Energy Systems shall apply

1. Within twelve months of the date when the project is fully operational, preferably within two weeks of the anniversary date of the pre-construction background sound measurements, repeat the measurements. Post-construction sound level measurements shall be taken both with all WES(s) running and with all WES(s) off except as provided in this ordinance.

2. Report post-construction measurements to the LGA using the same format as used for the background sound study.

VIII. REFERENCE Standards and ANSI S12.9 Part 3 with Required Amendments

ANSI/ASA S12.9-1993/Part 3 (R2008) - American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound, Part 3: Short-Term Measurements with an Observer Present

This standard is the second in a series of parts concerning description and measurement of outdoor environmental sound. The standard describes recommended procedures for measurement of short-term, time-average environmental sound outdoors at one or more locations in a community for environmental assessment or planning for compatible land uses and for other purposes such as demonstrating compliance with a regulation. These measurements are distinguished by the requirement to have an observer present. Sound may be produced by one or more separate, distributed sources of sound such as a highway, factory, or airport. Methods are given to correct the measured levels for the influence of background sound.

Wind Turbine Siting Acoustical Measurements
ANSI S12.9 Part 3 Selected Options and Requirement Amendments

For the purposes of this ordinance specific options provided in ANSI S12.9-Part 3 (2008) shall apply with the additional following requirements to Sections in ANSI S12.9/Part 3:

5.2 background sound: Use definition (1) 'long-term'
5.2 long-term background sound: The L_{90} excludes short term background sounds
5.3 basic measurement period: Ten (10) minutes $L_{eq(10\,min)}$
5.6 Sound Measuring Instrument: Type 1 Integrating Meter meeting ANSI S1.43 or IEC 61672-1. The sound level meter shall cover the frequency range from 6.3 Hz to 20k Hz and simultaneously measure dBA L_{90} and dBC L_{90}. The instrument must also be capable of accurately measuring low-level background sounds down to 20 dBA.
6.5 Windscreen: Required
6.n(a) An anemometer accurate to ± 10% at 2m/s. to full scale accuracy. The anemometer shall be located 1.5 to 2m above the ground and orientated to record maximum wind velocity. The maximum wind velocity, wind direction, temperature and humidity shall be recorded for each ten (10) minute sound measurement period observed within 5 m. of the measuring microphone..
7.1 Long-term background sound
7.2 Data collection Methods: Second method with observed samples to avoid contamination by short term sounds (purpose: to avoid loss of statistical data)
8 Source(s) Data Collection: All requirements in ANSI S12.18 Method #2 precision to the extent possible while still permitting testing of the conditions that lead to complaints. The

meteorological requirements in ANSI S12.18 may not be applicable for some complaints. For sound measurements in response to a complaint, the compliance sound measurements should be made under conditions that replicate the conditions that caused the complaint without exceeding instrument and windscreen limits and tolerances.

8.1(b) Measuring microphone with windscreen shall be located 1.2m to 1.8m (1.5m preferred) above the ground and greater than 8m from large sound reflecting surface.

8.3(a) All meteorological observations required at both (not either) microphone and nearest 10m weather reporting station.

8.3(b) For a 10 minute background sound measurement to be valid the wind velocity shall be less then 2m/s (4.5 mph) measured less than 5m from the microphone. Compliance sound measurements shall be taken when winds shall be less than 4m/s at the microphone.

8.3(c) In addition to the required acoustic calibration checks, the sound measuring instrument internal noise floor, including microphone, must also be checked at the end of each series of ten minute measurements and no less frequently than once per day. Insert the microphone into the acoustic calibrator with the calibrator signal off. Record the observed dBA and dBC reading on the sound level meter to determine an approximation of the instrument self noise. Perform this test before leaving the background measurement location. This calibrator-covered microphone must demonstrate the results of this test are at least 5 dB below the immediately previous ten-minute acoustic test results, for the acoustic background data to be valid. This test is necessary to detect undesired increase in the microphone and sound level meter internal self-noise. As a precaution sound measuring instrumentation should be removed from any air-conditioned space at least an hour before use. Nighttime measurements are often performed very near the meteorological dew point. Minor moisture condensation inside a microphone or sound level meter can increase the instrument self noise and void the measured background data.

8.4 The remaining sections starting at 8.4 in ANSI S12.9 Part 3 Standard do not apply.

ANSI S12.18-1994 (R2004) American National Standard Procedures for Outdoor Measurement of Sound Pressure Level

This American National Standard describes procedures for the measurement of sound pressure levels in the outdoor environment, considering the effects of the ground, the effects of refraction due to wind and temperature gradients, and the effects due to turbulence. This standard is focused on measurement of sound pressure levels produced by specific sources outdoors. The measured sound pressure levels can be used to calculate sound pressure levels at other distances from the source or to extrapolate to other environmental conditions or to assess compliance with regulation. This standard describes two methods to measure sound pressure levels outdoors. METHOD No. 1: general method; outlines conditions for routine measurements. METHOD No. 2: precision method; describes strict conditions for more accurate measurements. This standard assumes the measurement of A-weighted sound pressure level or time-averaged sound pressure level or octave, 1/3-octave or narrow-band sound pressure level, but does not preclude determination of other sound descriptors.

ANSI S1.43-1997(R2007) American National Standard Specifications for Integrating Averaging Sound Level Meters

This Standard describes instruments for the measurement of frequency-weighted and time-average sound pressure levels. Optionally, sound exposure levels may be measured. This standard is consistent with the relevant requirements of ANSI S1.4-1983(R 1997) American National Standard Specification for Sound Level Meters, but specifies additional characteristics that are necessary to

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1. Establishing Long-Term Background Noise Level

a. Instrumentation: ANSI or IEC Type 1 Precision Integrating Sound Level Meter plus meteorological instruments to measure wind velocity, temperature and humidity near the sound measuring microphone. Measurement procedures must meet ANSI S12.9, Part 3.

b. Measurement location(s): Nearest property line(s) from proposed wind turbines representative of all non-participating residential property within 2.0 miles.

c. Time of measurements and prevailing weather: The atmosphere must be classified as stable with no vertical heat flow to cause air mixing. Stable conditions occur in the evening and middle of the night with a clear sky and very little wind near the surface. Sound measurements are only valid when the measured wind speed at the microphone does not exceed 2 m/s (4.5 mph).

d. Long-Term Background sound measurements: All data recording shall be a series of contiguous ten (10) minute measurements. The measurement objective is to determine the quietest ten minute period at each location of interest. Nighttime test periods are preferred unless daytime conditions are quieter. The following data shall be recorded simultaneously for each ten (10) minute measurement period: dBA data includes L_{A10}, L_{A90}, L_{Aeq} and dBC data includes L_{C10}, L_{C90}, and L_{Ceq}. The maximum wind speed at the microphone during the ten minutes, a single measurement of temperature and humidity at the microphone for each new location or each hour whichever is oftener shall also be recorded. A ten (10) minute measurement contains valid data provided: Both L_{A10} minus L_{A90} and L_{C10} minus L_{C90} are not greater than 10 dB and the maximum wind speed at the microphone did not exceed 2 m/s during the same ten (10) minute period as the acoustic data.

2. Wind Turbine Sound Immission Limits

No wind turbine or group of turbines shall be located so as to cause wind turbine sound immission at any location on non-participating property containing a residence in excess of the limits in the following table.

Table of Not-To-Exceed Property Line Sound Immission Limits [1]

Criteria	Condition	dBA	dBC
A	Immission above pre-construction background:	$L_{Aeq} = L_{A90} + 5$	$L_{Ceq} = L_{C90} + 5$
B	Maximum immission:	35 L_{Aeq}	55 L_{Ceq} for quiet[2] rural environment 60 L_{Ceq} for rural-suburban environment
C	Immission spectra imbalance	L_{Ceq} (immission) minus (L_{A90} (background)+5) ≤ 20 dB	
D	Prominent tone penalty:	5 dB	5 dB
Notes			
1	Each Test is independent and exceedances of any test establishes non-compliance Sound "immission" is the wind turbine noise emission as received at a property		
2	A "Quiet rural environment" is a location 2 miles from a state road or other major transportation artery without high traffic volume during otherwise quiet periods of the day or night.		
3	Prominent tone as defined in IEC 61400-11. This Standard is not to be used for any other purpose.		

[1] Procedures provided in Section 7. Measurement Procedures (Appendix to Ordinance) of the most recent version of "**The How To Guide To Siting Wind Turbines To Prevent Health Risks From Sound**" by Kamperman and James apply to this table.

3. Wind Farm Noise Compliance Testing

All of the measurements outlined above in 1. Establishing the Long-Term Background Noise Level must be repeated to determine compliance with 2. Wind Turbine Sound Immission Limits. The compliance test location is to be the pre-turbine background noise measurement location nearest to the home of the complainant in line with the wind farm and nearer to the wind farm. The time of day for the testing and the wind farm operating conditions plus wind speed and direction must replicate the conditions that generated the complaint. Procedures of ANSI S12.9-Part 3 apply as amended. Instrumentation limits for wind and other factors must be recognized and followed.

The authors have based these criteria, procedures, and language on their current understanding of wind turbine sound emissions, land use compatibility, and the effects of sound on health. However, use of the following, in part or total, by any party is strictly voluntary and the user assumes all risks. Please seek professional assistance in applying the recommendations of this document to any specific community or WCS development.

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measure the time-average sound pressure level of steady, intermittent, fluctuating, and impulsive sounds.

ANSI S1.11-2004 American National Standard 'Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters'

This standard provides performance requirements for analog, sampled-data, and digital implementations of band-pass filters that comprise a filter set or spectrum analyzer for acoustical measurements. It supersedes ANSI S1.11-1986 (R1998) American National Standard Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters, and is a counterpart to International Standard IEC 61260:1995 Electroacoustics - Octave-Band and Fractional-Octave-Band Filters. Significant changes from ANSI S1.11-1986 have been adopted in order to conform to most of the specifications of IEC 61260:1995. This standard differs from IEC 61260:1995 in three ways: (1) the test methods of IEC 61260 clauses 5 is moved to an informative annex, (2) the term 'band number,' not present in IEC 61260, is used as in ANSI S1.11-1986, (3) references to American National Standards are incorporated, and (4) minor editorial and style differences are incorporated.

ANSI S1.40-2006 American National Standard Specifications and Verification Procedures for Sound Calibrators

IEC 61400-11

Second edition 2002-12, Amendment 1 2006-05

IEC 61400-11

Second edition 2002-12, Amendment 1 2006-0

Wind turbine generator systems –Part 11: Acoustic noise measurement techniques

The purpose of this part of IEC 61400 is to provide a uniform methodology that will ensure consistency and accuracy in the measurement and analysis of acoustical emissions by wind turbine generator systems. The standard has been prepared with the anticipation that it would be applied by:

- the wind turbine manufacturer striving to meet well defined acoustic emission performance requirements and/or a possible declaration system;
- the wind turbine purchaser in specifying such performance requirements;
- the wind turbine operator who may be required to verify that stated, or required, acoustic performance specifications are met for new or refurbished units;
- the wind turbine planner or regulator who must be able to accurately and fairly define acoustical emission characteristics of a wind turbine in response to environmental regulations or permit requirements for new or modified installations.

This standard provides guidance in the measurement, analysis and reporting of complex acoustic emissions from wind turbine generator systems. The standard will benefit those parties involved in the manufacture, installation, planning and permitting, operation, utilization, and regulation of wind turbines. The measurement and analysis techniques recommended in this document should be applied by all parties to insure that continuing development and operation of wind turbines is carried out in an atmosphere of consistent and accurate communication relative to environmental concerns. This standard presents measurement and reporting procedures expected to provide accurate results that can be replicated by others.

End of Measurement Procedure

E-Coustic Solutions
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Mr. Richard James is the Principal Consultant for E-Coustic Solutions, of Okemos, Michigan. Mr. James is an acoustical engineer with over 35 years of experience addressing community noise for new and existing industrial and commercial facilities. He is a Full Member of the Institute of Noise Control Engineers. He first joined the Institute in 1973. From 1973 through 1983, Mr. James was Vice President and co-owner of Total Environmental Systems. In addition to providing traditional acoustical engineering services, Mr. James directed the development of Sound6. This software permitted modeling of both community noise and noise inside manufacturing facilities. This software was used to assess compatibility with host communities for many new facilities for clients in the automotive, tire and types of manufacturing operations.

Mr. James is the former President of James, Anderson & Associates, Inc., an acoustical consulting firm whose clients included Fortune 100 companies from 1983 until 2006. The company grew from the original two partners to a staff of over 40 acoustical engineers, industrial hygienists and technicians. As President, and Principal Consultant, he and his partner developed partnerships with companies such as: General Motors, Ford, Chrysler, Goodyear Rubber Company, Anheuser Busch and Deer and Company, as well as many smaller firms. Services included consulting on community noise issues for existing plants where complaints led to governmental actions against the firms or site selection and planning for new facilities to determine compatibility of the proposed facility and the existing neighborhood.

Mr. James has personally conducted studies and provided other services for his firm's clients throughout the U.S., Canada, Mexico, and Europe. In 2006, Mr. James and his partner, Robert Anderson, closed James, Anderson and Associates, Inc.. Mr. James now provides his consulting services through his new firm: E-Coustic Solutions (E-CS).

In addition to his consulting interests, Mr. James has served as an Adjunct to Michigan State University's Department of Communicative and Disorders for 20 years. Until 2006, Mr. James was a member of the American National Standards Institute's S12 Committee which has oversight responsibilities for acoustical test methods and procedures used to standardize the work of acousticians and noise control engineers for measuring sound and assessing Land-Use-Compatibility.

In 2008, Mr. James, and his collaborator, George Kamperman, prepared a manuscript describing the appropriate noise criteria for use in regulations and permitting guidelines for wind turbine projects to prevent adverse health effects for people living near the footprint of rural wilderness wind utilities. These guidelines have been used world-wide as the basis for local wind turbine siting guidelines. Mr. James has condtinued this works by partnering with other acoustics and medical experts interested in exploring the relationships between wind turbine sound emissions and the reports of adverse health effects on people living in close proximity to utility scale wind energy projects.

Since 2006, when the first major wind turbine projects were announced in Michigan, Mr. James has worked on developing siting criteria for county and township governments, conducting acoustical tests of operating wind turbines and pre-construction background sound studies, providing testimony at zoning hearings and public presentations for clients in Michigan, Ohio, Wisconsin, Illinois, West Virginia, Pennsylvania, New York, Maine, Ontario, and other states and countries.

Rev:.6/29/11

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE	BIRTHDATE
Richard R. James	Principal Consultant, E-Coustic Solutions	3/3/48
	Adjunct Instructor, Michigan State University	

EDUCATION

INSTITUTION	DEGREE	YEAR	FIELD OF STUDY
General Motors Institute, Flint, MI	B. Mech. Eng.	1971	Noise Control Engineering

RESEARCH AND PROFESSIONAL EXPERIENCE:
Richard R. James has been actively involved in the field of noise control since 1969, participating in and supervising research and engineering projects related to control of occupational and community noise in industry. In addition to his technical responsibilities as principal consultant, he has developed noise control engineering and management programs for the automotive, tire manufacturing, and appliance industries. Has performed extensive acoustical testing and development work in a variety of complex environmental noise problems utilizing both classical and computer simulation techniques. In 1975 he co-directed (with Robert R. Anderson) the development of SOUND™, an interactive acoustical modeling computer software package based on the methods that would be later codified in ISO 9613-2 for pre and post-build noise control design and engineering studies of in-plant and community noise. The software was used on projects with General Motors, Ford Motor Company, The Goodyear Tire & Rubber Co., and a number of other companies for noise control engineering decision making during pre-build design of new facilities and complaint resolution at existing facilities. The SOUND™ computer model was used by Mr. James in numerous community noise projects involving new and existing manufacturing facilities to address questions of land-use compatibility and the effect of noise controls on industrial facility noise emissions. He is also the developer of One*dB℠ software. He was also a co-developer (along with James H. Pyne, Staff Engineer GM AES) of the Organization Structured Sampling method and the Job Function Sound Exposure Profiling Procedure which in combination form the basis for a comprehensive employee risk assessment and sound exposure monitoring process suitable for use by employers affected by OSHA and other governmental standards for occupational sound exposure. Principal in charge of JAA's partnership with UAW, NIOSH, Ford, and Hawkwa on the HearSaf 2000™ software development CRADA partnership for world-class hearing loss prevention tools.

1966-1970	Co-operative student: General Motors Institute and Chevrolet Flint Metal Fabricating Plant.
1970-1971	GMI thesis titled: "Sound Power Level Analysis, Procedure and Applications". This thesis presented a method for modeling the effects of noise controls in a stamping plant. This method was the basis for SOUND™
1970-1972	Noise Control Engineer-Chevrolet Flint Metal Fabricating Plant. Responsible for developing and implementing a Noise Control and Hearing Conservation Program for the Flint Metal Fabricating Plant. Member of the GM Flint Noise Control Committee which crafted the first standards for community noise, GM's Uniform Sound Survey Procedure, "Buy Quiet" purchasing specification, and guidelines for implementing a Hearing Conservation Program.
1972-1983	Principal Consultant, Total Environmental Systems, Inc.; Lansing, MI. Together with Robert R. Anderson formed a consulting firm specializing in community and industrial noise control.
1973-1974	Consultant to the American Metal Stamping Association and member firms for in-plant and community noise
1973	Published: "Computer Analysis and Graphic Display of Sound Pressure Level Data For Large Scale Industrial Noise Studies", Proceedings of Noise-Con '73, Washington D.C.. This was the first paper on use of sound level contour 'maps' to represent sound levels from computer predictions and noise studies.
Nov. 1973	Published: "Isograms Show Sound Level Distribution In Industrial Noise Studies", Sound&Vibration Magazine
1975	Published: "Computer Assisted Acoustical Engineering Techniques", Noise-Expo 1975, Atlanta, GA which advanced the use of computer models and other computer-based tools for acoustical engineers.
1976	Expert Witness for GMC at OSHA Hearings in Washington D.C. regarding changes to the "feasible control" and cost-benefit elements of the OSHA Noise Standard. Feasibility of controls and cost-benefit were studied for the GMC, Fisher Body Stamping Plant, Kalamazoo MI.
1977-1980	Principal Consultant to GMC for the use of SOUND ™ computer simulation techniques for analysis of design, layout, and acoustical treatment options for interior and exterior noise from a new generation of assembly plants. This study started with the GMAD Oklahoma City Assembly Plant. Results of the study were used to refine noise control design options for the Shreveport, Lake Orion, Bowling Green plants and many others.
1979-1983	Conducted an audit and follow-up for all Goodyear Tire & Rubber Company's European and U.K. facilities for community and in-plant noise.

1981-1985	Section Coordinator/Speaker, Michigan Department Of Public Health, "Health in the WorkPlace" Conference
1981	Published: "A Practical Method For Cost-Benefit Analysis of Power Press Noise Control Options", Noise-Expo 1981, Chicago, Illinois
1981	Principal Investigator, Phase III of Organization Resources Counselors (ORC), Washington D.C., Power Press Task Force Study of Mechanical Press Working Operations. Resulted in publishing: "User's Guide for Noise Emission Event Analysis and Control", August 1981
1981-1991	Consultant to General Motors Corporation and Central Foundry Division, Danville Illinois in community noise citation initiated by Illinois EPA for cupola noise emissions. Resulted in a petition to the IEPA to change state-wide community noise standards to account for community response to noise by determining compliance using a one hour L_{eq} instead of a single not-to-exceed limit
1983	Published: "Noise Emission Event Analysis-An Overview", Noise-Con 1983, Cambridge, MA
1983-2006	Principal Consultant, James, Anderson & Associates, Inc.; Lansing, MI. (JAA). Together with Robert R. Anderson formed a consulting firm specializing in Hearing Conservation, Noise Control Engineering, and Program Management
1983-2006	Retained by GM Advanced Engineering Staff to assist in the design and management of GM's on-going community noise and in-plant noise programs.
1984-1985	Co-developed the 1985 GM Uniform Plant Sound Survey Procedure and Guidelines with James H. Pyne, Staff Engineer, GM AES.
1985-Present	**Adjunct Instructor, Michigan State University, Department of Communicative Sciences and Disorders**
1986-1987	Principal Consultant to Chrysler Motors Corporation, Plant Engineering and Environmental Planning Staff. Conducted Noise Control Engineering Audits of all manufacturing and research facilities to identify feasible engineering controls and development of a formal Noise Control Program.
1988-2006	Co-instructor, General Motors Corporation Sound Survey Procedure (Course 0369)
1990	Developed One*dB℠, JAA's Occupational Noise Exposure Database manager to support Organizational structured sampling strategy and Job Function Profile (work-task) approach for sound exposure assessment
1990-1991	Co-developed the 1991 GM Uniform Plant Sound Survey Procedure and Guidelines with James H. Pyne, Staff Engineer, GM AES. Customized One*dB℠ software to support GM's program.
1990-2006	Principal Consultant to Ford Motor Company to investigate and design documentation and computer data management systems for Hearing Conservation and Noise Control Engineering Programs. This included bi-annual audits of all facilities.
1993-2006	GM and Ford retain James and JAA as First-Tier Partners for all non-product related noise control services.
1993	Invited paper: "An Organization Structured Sound Exposure Risk Assessment Sampling Strategy" at the 1993 AIHCE
1993	Invited paper: "An Organization Structured Sound Exposure Risk Assessment Database" at the Conference on Occupational Exposure Databases, McLean, VA sponsored by ACGIH
1994-2001	Instructor for AIHA Professional Development Course, "Occupational Noise Exposure Assessment"
1996	Task Based Survey Procedure (used in One*dB℠) codified as part of ANSI S12.19 Occ. Noise Measurement
1995-2001	Coordinate JAA's role in HearSaf 2000™ CRADA with NIOSH, UAW,Ford, and HAWKWA
1997-Present	Board Member, Applied Physics Advisory Board, Kettering Institute, Flint Michigan
2002-2006	Member American National Standards Accredited Standards (ANSI) Committee S12, Noise
2005-Present	Consultant to local communities and citizens groups on proper siting of Industrial Wind Turbines. This includes presentations to local governmental bodies, assistance in writing noise standards, and formal testimony at zoning board hearings and litigation
2006	Founded E-Coustic Solutions
2008	Paper on "Simple guidelines for siting wind turbines to prevent health risks" for INCE Noise-Con 2008, co-authored with George Kamperman, Kamperman Associates.
2008	Expanded manuscript supporting Noise-Con 2008 paper titled: "The 'How To' Guide To Siting Wind Turbines To Prevent Health Risks From Sound"
2010	Punch, J., James, R., Pabst, D., "Wind Turbine Noise, What Audiologists should know," Audiology Today, July-August 2010
2011	Jerry L. Punch, Jill L. Elfenbein, and Richard R. James, "Targeting Hearing Health Messages for Users of Personal Listening Devices," Am J Audiol 0: 1059-0889_2011_10-0039v1

2011	Bray, W., HEAD Acoustics, James, R., "Dynamic measurements of wind turbine acoustic signals, employing sound quality engineering methods considering the time and frequency sensitivities of human perception," invited paper for Noise-Con 2011, Portland OR
2011	James, R., "Wind Turbine Infra and Low Frequency Sound: Warning Signs that were not Heard." Pending publication in a collection of papers on Wind Turbines and Health by Sage.

PROFESSIONAL AFFILIATIONS/MEMBERSHIPS

Research Fellow - Metrosonics, Inc		American Industrial Hygene Association (past)
National Hearing Conservation Association		Institute of Noise Control Engineers (Full Member)
American National Standards S12 Working Group (past)		Board Member of the Society for Wind Vigilance, Inc.

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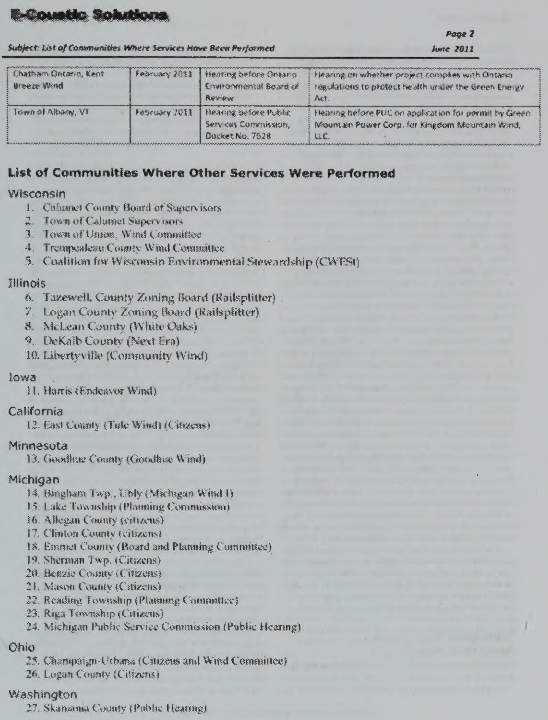
June 2011

Summary of Court and Administrative Cases for Richard R. James

Jurisdiction	Date	Case No.	Topic
Huron County, MI Zoning Board	04-04-2007	N/A	Oral testimony at Hearing on Permit Application before ZB by Noble Env. for Michigan Wind I on why 50 dBA criteria will result in complaints and litigation
Calumet County Board of Supervisors, WI	10-30-2007	N/A	Oral Testimony to County Board of Commissioners on requirements for sound criteria in a License and its Appendices related to Wind Energy Systems.
Logan County, IL, ZB/PC	05-01-2008	N/A	Oral Testimony on Wind Turbine Siting, Illinois Noise Regulations, and rebuttal of reports prepared on behalf of the Rail Splitter Wind LLC
Tazewell County, IL, ZB/PC	05-14-2008	N/A	Oral Testimony on Wind Turbine Siting, Illinois Noise Regulations, and rebuttal of reports prepared on behalf of the Rail Splitter Wind LLC
Laurel Mtn, WV (PSC)	08-05-2008	08-0109-E-CSCN	Oral Testimony on Wind Turbine Siting, background sound levels, and rebuttal of reports prepared on behalf of AES Laurel Mountain, LLC
Wellington, NZ (Hearing)	09-05-2008	N/A	Provide written and oral testimony at hearing to rebut reports prepared on behalf of Meridian Energy Ltd for Mill Creek Wind Utility
Beech Ridge, WV (PSC)	10-16-2008	05-1590-E-CS	Oral Testimony on Wind Turbine Siting, background sound levels, and rebuttal of reports prepared on behalf of Beech Ridge Energy, LLC
Record Hill Wind, ME (DEP)	02-18-2009 08-17-2009	#L-24441-24-A-N/L-24441-TF-B-N	Written Testimony on Wind Turbine siting and rebuttal of reports prepared on behalf of Record Hill wind, LLC
Dekalb County, IL	05-11-2009	Public Hearing	Oral Testimony on Wind Turbine Siting, background sound levels, and rebuttal of reports prepared on behalf of Florida Power and Light
Ontario, CA	07-24-2009	MOE EBR – 010 – 6708 and EBR-10-6516	Comments on behalf of APPEC (Association to Protect Prince Edward County), Proposed Ministry of the Environment Regulations to Implement the Green Energy and Green Economy Act, 2009
Buckeye Wind, Champaign-Urbana, Ohio	Oct.-Dec. 2009	OPSB Case No: 08-666-EL-BGN	Hearing on Application for Permit by Buckeye Wind before OPSB.
Glacier Hills, WI	Sept.-Nov. 2009	WPSC Case 6630-CE-302	Hearing on Application for Permit by WEPCO for Glacier Hills project before Wisconsin PSC.
Record Hill Wind, Roxbury Pond, Me	March 2010	L-24441-24-A-Z L-24441-TF-B-Z	Hearing on Appeal before Maine DEP Board
Georgia Mountain Wind, VT	March 2010	PSB Docket No. 7508	Hearing before Public Services Commission
Goodhue, MN	July 21, 22, 2010	MPUC Docket No. IP/6701/CN-09-1186 and IP-6701/WS-08-1233	Hearing before PUC ALJ on application for Certificate of Need and Large Wind Energy System Site Permit for 78 MW Goodhue Wind Project
Madison, WI for CWESt	October 10, 2010	Clearinghouse Rule 10-057,	Senate Committee on Commerce, Utilities, Energy, and Rail Public Hearing onp Siting Wind Energy Systems
Georgia and Milton, VT	Nov. 2010	Hearing before Public Services Commission, Docket No. 7508	Hearing before PUC on application for permit to build wind turbine utility on Georgia Mountain
Saddleback Ridge Wind, Carthage, ME for Friends of Maine's Mountains	Nov. 2010	Hearing on Application	Application approval process before Maine's Dept. of Env. Prot. for ridge mounted turbines.



Chatham Ontario, Kent Breeze Wind	February 2011	Hearing before Ontario Environmental Board of Review	Hearing on whether project complies with Ontario regulations to protect health under the Green Energy Act.
Town of Albany, VT	February 2011	Hearing before Public Services Commission, Docket No. 7628	Hearing before PUC on application for permit by Green Mountain Power Corp. for Kingdom Mountain Wind, LLC.

List of Communities Where Other Services Were Performed

Wisconsin

1. Calumet County Board of Supervisors
2. Town of Calumet Supervisors
3. Town of Union, Wind Committee
4. Trempealeau County Wind Committee
5. Coalition for Wisconsin Environmental Stewardship (CWESt)

Illinois

6. Tazewell, County Zoning Board (Railsplitter)
7. Logan County Zoning Board (Railsplitter)
8. McLean County (White Oaks)
9. DeKalb County (Next Era)
10. Libertyville (Community Wind)

Iowa

11. Harris (Endeavor Wind)

California

12. East County (Tule Wind) (Citizens)

Minnesota

13. Goodhue County (Goodhue Wind)

Michigan

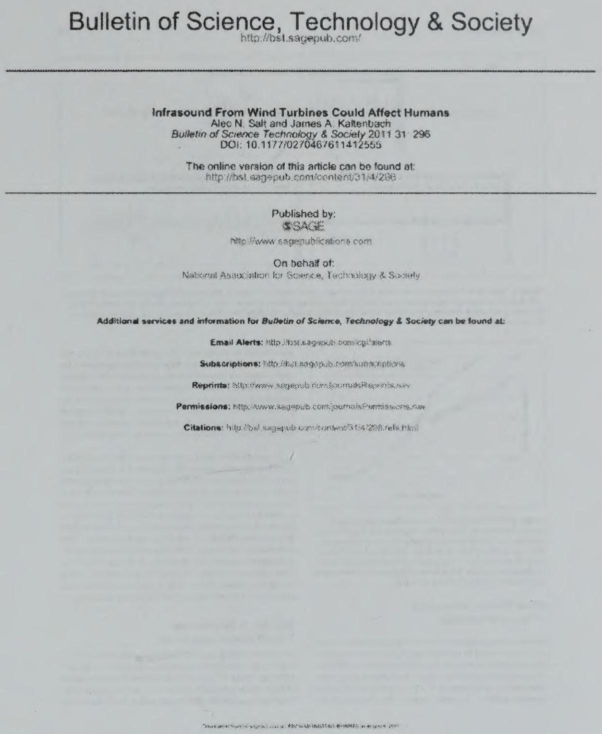
14. Bingham Twp., Ubly (Michigan Wind I)
15. Lake Township (Planning Commission)
16. Allegan County (citizens)
17. Clinton County (citizens)
18. Emmet County (Board and Planning Committee)
19. Sherman Twp. (Citizens)
20. Benzie County (Citizens)
21. Mason County (Citizens)
22. Reading Township (Planning Committee)
23. Riga Township (Citizens)
24. Michigan Public Service Commission (Public Hearing)

Ohio

25. Champaign-Urbana (Citizens and Wind Committee)
26. Logan County (Citizens)

Washington

27. Skamania County (Public Hearing)



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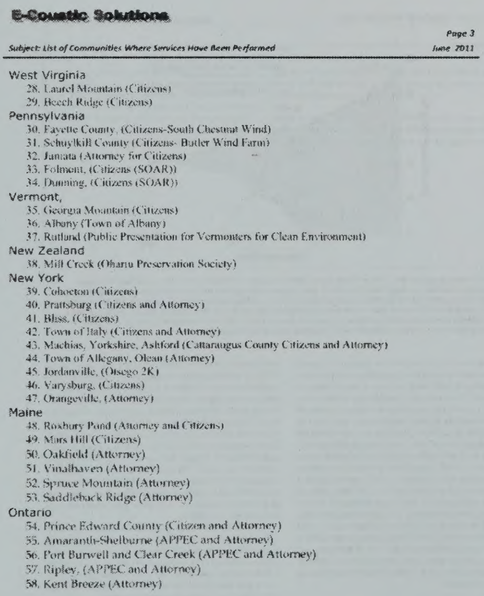

West Virginia

28. Laurel Mountain (Citizens)
29. Beech Ridge (Citizens)

Pennsylvania

30. Fayette County, (Citizens-South Chestnut Wind)
31. Schuylkill County (Citizens- Butler Wind Farm)
32. Juniata (Attorney for Citizens)
33. Folmont, (Citizens (SOAR))
34. Dunning, (Citizens (SOAR))

Vermont,

35. Georgia Mountain (Citizens)
36. Albany (Town of Albany)
37. Rutland (Public Presentation for Vermonters for Clean Environment)

New Zealand

38. Mill Creek (Ohariu Preservation Society)

New York

39. Cohocton (Citizens)
40. Prattsburg (Citizens and Attorney)
41. Bliss, (Citizens)
42. Town of Italy (Citizens and Attorney)
43. Machias, Yorkshire, Ashford (Cattaraugus County Citizens and Attorney)
44. Town of Allegany, Olean (Attorney)
45. Jordanville, (Otsego 2K)
46. Varysburg, (Citizens)
47. Orangeville, (Attorney)

Maine

48. Roxbury Pond (Attorney and Citizens)
49. Mars Hill (Citizens)
50. Oakfield (Attorney)
51. Vinalhaven (Attorney)
52. Spruce Mountain (Attorney)
53. Saddleback Ridge (Attorney)

Ontario

54. Prince Edward County (Citizen and Attorney)
55. Amaranth-Shelburne (APPEC and Attorney)
56. Port Burwell and Clear Creek (APPEC and Attorney)
57. Ripley, (APPEC and Attorney)
58. Kent Breeze (Attorney)

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Infrasound From Wind Turbines Could Affect Humans

Alec N. Salt[1] and James A. Kaltenbach[2]

Abstract

Wind turbines generate low-frequency sounds that affect the ear. The ear is superficially similar to a microphone, converting mechanical sound waves into electrical signals, but does this by complex physiologic processes. Serious misconceptions about low-frequency sound and the ear have resulted from a failure to consider in detail how the ear works. Although the cells that provide hearing are insensitive to infrasound, other sensory cells in the ear are much more sensitive, which can be demonstrated by electrical recordings. Responses to infrasound reach the brain through pathways that do not involve conscious hearing but instead may produce sensations of fullness, pressure or tinnitus, or have no sensation. Activation of subconscious pathways by infrasound could disturb sleep. Based on our current knowledge of how the ear works, it is quite possible that low-frequency sounds at the levels generated by wind turbines could affect those living nearby.

Keywords

cochlea, hair cells, A-weighting, wind turbine, Type II auditory afferent fibers

Wind Turbines Generate Infrasound

The sounds generated by wind turbines vary widely, depending on many factors such as the design, size, rotor speed, generator loading, and different environmental conditions such as wind speed and turbulence (e.g., Jakobsen, 2005). Under some conditions, such as with a low wind speed and low generator loading, the sounds generated appear to be benign and are difficult to detect above other environmental sounds (Sonus, 2010).

But in many situations, the sound can contain a substantial low-frequency infrasound component. One study (Van den Berg, 2006) reported wind turbine sounds measured in front of a home 750 m from the nearest turbine of the Rhede wind farm consisting of Enercon E-66 1.8 MW turbines, 98 m hub height, and 35 m blade length. A second study (Jung & Cheung, 2008) reported sounds measured 148 to 296 m from a 1.5 MW turbine, 62 m hub height, 36 m blade length. In both these studies, which are among the few publications that report full-spectrum sound measurements of wind turbines, the sound spectrum was dominated by frequencies below 10 Hz, with levels of over 90 dB SPL near 1 Hz.

The infrasound component of wind turbine noise is demonstrated in recordings of the sound in a home with GE 1.5 MW wind turbines 1,500 ft downwind as shown in Figure 1. This 20-second recording was made with a microphone capable of recording low-frequency components. The sound level over the recording period, from which this excerpt was taken, varied from 28 to 43 dBA. The audible and inaudible (infrasound) components of the sound are demonstrated by filtering the waveform above 20 Hz (left) or below 20 Hz (right). In the audible, high-pass filtered waveform, the periodic "swoosh" of the blade is apparent to a varying degree with time. It is apparent from the low-pass filtered waveform that the largest peaks in the original recording represent inaudible infrasound. Even though the amplitude of the infrasound waveform is substantially larger than that of the audible component, this waveform is inaudible when played by a computer's sound system. This is because conventional speakers are not capable of generating such low frequencies and even if they could, these frequencies are typically inaudible to all but the most sensitive unless played at very high levels. It was also notable in the recordings that the periods of high infrasound level do not coincide with those times when the audible component is high.

This shows that it is impossible to judge the level of infrasound present based on the audible component of the sound. Just because the audible component is loud does not mean that high levels of infrasound are present. These measurements show that wind turbine sounds recorded inside a home can contain a prominent infrasound component.

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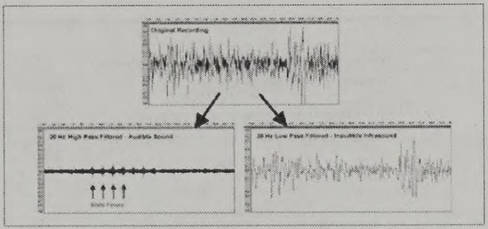

Figure 1. *Upper Panel:* Full-spectrum recording of sound from a wind turbine recorded for 20 seconds in a home with the wind turbine 1,500 ft downwind (digital recording kindly provided by Richard James). *Lower Left Panel:* Result of high-pass filtering the waveform at 20 Hz, showing the sound that is heard, including the sounds of blade passes. *Lower Right Panel:* Result of low-pass filtering the waveform at 20 Hz, showing the infrasound component of the sound

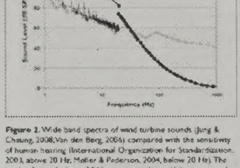

Figure 2. Wide band spectra of wind turbine sounds (Jung & Cheung, 2008; Van den Berg, 2006) compared with the sensitivity of human hearing (International Organization for Standardization, 2003, above 20 Hz; Møller & Pedersen, 2004, below 20 Hz). The levels of sounds above 30 Hz are above the audibility curve and would be heard. Below 30 Hz, levels are below the audibility curve so these components would not be heard

Wind Turbine Infrasound Is Typically Inaudible

Hearing is very insensitive to low-frequency sounds, including those generated by wind turbines. Figure 2 shows examples of wind turbine sound spectra compared with the sensitivity of human hearing. In this example, the turbine sound components above approximately 30 Hz are above threshold and therefore audible. The sounds below 30 Hz, even though they are of higher level, are below the threshold of audibility and therefore may not be heard. Based on this comparison, for years it has been assumed that the infrasound from wind turbines is not significant to humans. Leventhall (2006) concluded that "infrasound from wind turbines is below the audible threshold and of no consequence." (p.34) Leventhall (2007) further stated that "if you cannot hear a sound you cannot perceive it in other ways and it does not affect you." (p.135)

Renewable UK (2011), the website of the British Wind Energy Association, quotes Dr. Leventhall as stating, "I can state quite categorically that there is no significant infrasound from current designs of wind turbines." Thus, the fact that hearing is insensitive to infrasound is used to exclude the possibility that the infrasound can have any influence on humans. This has been known for many years in the form of the statement, "What you can't hear can't affect you." The problem with this concept is that the sensitivity of "hearing" is assumed to equate with sensitivity of "the ear." So if you cannot hear a sound then it is assumed that the sound is insufficient to stimulate the ear. Our present knowledge of the physiology of the ear suggests that this logic is incorrect.

The Ear Is Sensitive to Wind Turbine Infrasound

The sensory cells responsible for hearing are contained in a structure in the cochlea (the auditory portion of the inner ear) called the organ of Corti. This organ runs the entire length of the cochlear spiral and contains two types of sensory cells, which have completely different properties. There is one row of sensory inner hair cells (IHC) and three rows of outer hair cells (OHC) as shown schematically in the inset to Figure 3. For both IHC and OHC, sound-induced deflections of the cell's sensory hairs provide stimulation and elicit electrical responses. Each IHC is innervated by multiple nerve fibers that transmit information to the brain, and it is widely accepted that hearing occurs through the IHC. The rapidly declining sensitivity of hearing at lower frequencies (Figure 2) is accounted for by three processes that selectively reduce low-frequency sensitivity (Cheatham & Dallos, 2001), specifically the properties of middle ear mechanics, from pressure shunting through the cochlear helicotrema and from "fluid coupling" of the inner hair cell stereocilia to the stimulus (reviewed in detail by Salt & Hullar, 2010).

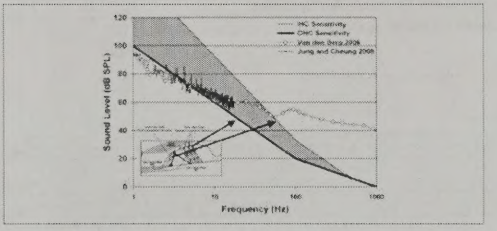

Figure 3. The thin line shows the estimated sensitivity of inner hair cells (IHC) as a function of frequency which is comparable with the human audibility curve shown in Figure 2 and which is consistent with hearing being mediated by the IHC (based on Cheatham & Dallos, 2001). The thick line shows the estimated sensitivity of the outer hair cells (OHC), which are substantially more sensitive than the IHC. Sound components of the overlaid wind turbine spectra within the shaded region (approximately 5 to 50 Hz) are too low to stimulate the IHC and cannot therefore be heard but are of sufficient level to stimulate the OHC. The inset shows a cross section of the sensory organ of the cochlea (the organ of Corti) showing the locations of the IHC and OHC

The combined effect of these processes, quantified by Cheatham and Dallos (2001), are shown as the "IHC sensitivity" curve in Figure 3. The last component attenuating low frequencies, the so-called fluid coupling of input, arises because the sensory hairs of the IHC do not contact the overlying gelatinous tectorial membrane but are located in the fluid space below the membrane.

As a result, measurements from the IHC show that they do not respond to sound-induced displacements of the structure but instead their amplitude and phase characteristics are consistent with them responding to the velocity of the stimulus. As stimulus frequency is lowered, the longer cycles result in lower stimulus velocity, so the effective stimulus falls by 6 dB/octave. This accounts for the known insensitivity of the IHC to low-frequency stimuli. For low frequencies, the calculated sensitivity of IHC (Figure 3) compares well with measures of hearing sensitivity (Figure 2), supporting the view that hearing is mediated by the IHC.

The problem, however, arises from the more numerous OHC of the sensory organ of Corti of the ear. Anatomic studies show that the sensory hairs of the OHC are embedded in the overlying tectorial membrane, and electrical measurements from these cells show their responses depend on the displacement rather than the velocity of the structure. As a result, their responses do not decline to the same degree as IHC as frequency is lowered.

Their calculated sensitivity is shown as the "OHC sensitivity" curve in Figure 3. It is important to note that the difference between IHC and OHC responses has nothing to do with frequency-dependent effects of the middle ear or of the helicotrema (the other two of the three components mentioned above). For example, any attenuation of low-frequency stimuli provided by the helicotrema will equally affect both the IHC and the OHC. So the difference in sensitivity shown in Figure 3 arises purely from the difference in how the sensory hairs of the IHC and OHC are coupled to the overlying tectorial membrane.

The important consequence of this physiological difference between the IHC and the OHC is that the OHC are stimulated at much lower levels than the IHC. In Figure 3, the portion of the wind turbine sound spectrum within the shaded region represents frequencies and levels that are too low to be heard, but which are sufficient to stimulate the OHC of the ear.

This is not confined to infrasonic frequencies (below 20 Hz), but in this example includes sounds over the range from 5 to 50 Hz. It is apparent that the concept that "sounds you can't hear cannot affect you" cannot be correct because it does not recognize these well-documented physiologic properties of the sensory cells of the inner ear.

Stimulation of OHC at inaudible, low levels can have potentially numerous consequences. In animals, cochlear microphonics demonstrating the responses of the OHC can be recorded to infrasonic frequencies (5 Hz) at levels as low as 40 dB SPL (Salt & Lichtenhan, in press). The OHCs are innervated by Type II nerve fibers that constitute 5% to 10% of the auditory nerve fibers, which connect the hair cells to the brainstem. The other 90% to 95% come from the IHCs. Both Type I (from IHC) and Type II (from OHC) nerve fibers terminate in the cochlear nucleus of the brainstem, but the anatomical connections of the two systems increasingly appear to be quite different. Type I fibers terminate on the main output neurons of the cochlear nucleus. For example, in the dorsal part of the cochlear nucleus, Type I fibers connect with fusiform cells, which directly process information received from the ear and then deliver it to higher levels of the auditory pathway. In contrast, Type II fibers terminate in the granule cell regions of the cochlear nucleus (Brown, Berglund, Kiang, & Ryugo, 1988). Some granule cells receive direct input from Type II fibers (Berglund & Brown, 1994). This is potentially significant because the granule cells provide a major source of input to nearby cells, whose function is inhibitory to the fusiform cells that are processing heard sounds. If Type II fibers excite granule cells, their ultimate effect would be to diminish responses of fusiform cells to sound. Evidence is mounting that loss of or even just overstimulation of OHC's may lead to major disturbances in the balance of excitatory and inhibitory influences in the dorsal cochlear nucleus. One product of this disturbance is the emergence of hyperactivity, which is widely believed to contribute to the perception of phantom sounds or tinnitus (Kaltenbach et al., 2002; Kaltenbach & Godfrey, 2008). The granule cell system also connects to numerous auditory and nonauditory centers of the brain (Shore, 2005). Some of these centers are directly involved in audition, but others serve functions as diverse as attentional control, arousal, startle, the sense of balance, and the monitoring of head and ear position (Godfrey et al., 1997).

Functions that have been attributed to the dorsal cochlear nucleus thus include sound localization, cancellation of self-generated noise, orienting the head and ears to sound sources, and attentional gating (Kaltenbach, 2006; Oertel & Young, 2004). Thus, any input from OHC's to the circuitry of the dorsal cochlear nucleus could influence functions at several levels.

A-Weighted Wind Turbine Sound Measurements

Measurements of sound levels generated by wind turbines presented by the wind industry are almost exclusively A-weighted and expressed as dBA. When measured in this manner, the sound levels near turbines are typically in the range of 30 to 50 dBA, making wind turbine sounds,

> about the same level as noise from a flowing stream about 50-100 meters away or the noise of leaves rustling in a gentle breeze. This is similar to the sound level inside a typical living room with a gas fire switched on, or the reading room of a library or in an unoccupied, quiet, air-conditioned office. (Renewable UK, 2011)

On the basis of such measurements, we would expect wind turbines to be very quiet machines that would be unlikely to disturb anyone to a significant degree. In contrast, the human perception of wind turbine noise is considerably different. Pedersen and Persson-Waye (2004) reported that for many other types of noise (road traffic, aircraft, railway), the level required to cause annoyance in 30% of people was over 70 dBA, whereas wind turbine noise caused annoyance of 30% of people at a far lower level, at around 40 dBA. This major discrepancy is probably a consequence of A-weighting the wind turbine sound measurements, thereby excluding the low-frequency components that contribute to annoyance. A-weighting corrects sound measurements according to human hearing sensitivity (based on the 40 phon sensitivity curve). The result is that low-frequency sound components are dramatically deemphasized in the measurement, based on the rationale that these components are less easily heard by humans. An example showing the effect of A-weighting the turbine sound spectrum data of Van den Berg (2006) is shown in Figure 4. The low-frequency components of the original spectrum, which resulted in a peak level of 93 dB SPL at 1 Hz, are removed by A-weighting, leaving a spectrum with a peak level of 42 dBA near 1 kHz. A-weighting is perfectly acceptable if hearing the sound is the important factor. A problem arises though when A-weighted measurements or spectra are used to assess whether the wind turbine sound affects the ear. We have shown above that some components of the inner ear, specifically the OHC, are far more sensitive to low-frequency sounds than is hearing. Therefore, A-weighted sounds do not give a valid representation of whether wind turbine noise affects the ear or other aspects of human physiology mediated by the OHC and unrelated to hearing. From Figure 3, we know that sound frequencies down to 3 to 4 Hz may be stimulating the OHC, yet the A-weighted spectrum in Figure 4 cuts off all components below approximately 14 Hz. For this reason, the determination of whether wind turbine sounds affect people simply cannot be made based on A-weighted sound measurements. A-weighted measurements are inappropriate for this purpose and give a misleading representation of whether the sound affects the ear.

Alternatives to A-weighting are the use of full-spectrum (unweighted), C-weighted, or G-weighted measurements. G-weighted measurements use a weighting curve based on the human audibility curve below 20 Hz and a steep cutoff above 20 Hz so that the normal audible range of frequencies is deemphasized. Although the shape of this function is arbitrary when hearing is not the primary issue, it does give a measure of the infrasound content of the sound that is independent of higher frequency, audible components, as shown in Figure 4. By applying the function to the normal human hearing sensitivity curve, it can be shown that sounds of approximately 95 dBG will be heard by humans, which agrees with observations by Van den Berg (2006). Similarly, by G-weighting the OHC sensitivity function in Figure 3, it can be estimated that sound levels of 60 dBG will stimulate the OHC of the human ear. In a survey of infrasound levels produced by wind turbines measured in dBG (Jakobsen, 2005), upwind turbines typically generated infrasound of 60 to 70 dBG, although levels above and below this range were observed in this and other studies. From Jakobsen's G-weighted measurements, we conclude that the level of infrasound produced by wind turbines is of too low a level to be heard, but in most cases is sufficient to cause stimulation of the OHC of the human ear. C-weighting also provides more representation of low-frequency sound components but still arbitrarily de-emphasizes infrasound components.

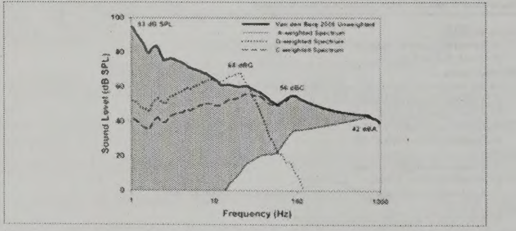

Figure 4. Low-frequency components of wind turbine sound spectrum (below 1 kHz) before and after A-weighting. The original spectrum was taken from Van den Berg (2006). The shaded area represents the degree of alteration of the spectrum by A-weighting. A-weighting (i.e., adjusting the spectrum according to the sensitivity of human hearing) has the effect of ignoring the fact that low-frequency sounds can stimulate the OHC at levels that are not heard. Representing this sound as 42 dBA, based on the peak of the spectrum, ignores the possibility that low-frequency components down to frequencies as low as 5 Hz (from Figure 3) are stimulating the OHC. Also shown are the spectra after G-weighting (dotted) and C-weighting (dashed) for comparison

Is the Infrasound From Wind Turbines Harmful to Humans Living Nearby?

Our present understanding of inner ear physiology and of the nature of wind turbine sounds demonstrates that low-level infrasound produced by wind turbines is transduced by the OHC of the ear and this information is transmitted to the cochlear nucleus of the brain via Type II afferent fibers. We therefore conclude that dismissive statements such as "there is no significant infrasound from current designs of wind turbines" are undoubtedly false. The fact that infrasound-dependent information, at levels that are not consciously heard, is present at the level of the brainstem provides a scientific basis for the possibility that such sounds can have influence on people. The possibility that low-frequency components of the sound could contribute both to high annoyance levels and possibly to other problems that people report as a result of exposure to wind turbine noise cannot therefore be dismissed out of hand.

Nevertheless, the issue of whether wind turbine sounds can cause harm is more complex. In contrast to other sounds, such as loud sounds, which are harmful and damage the internal structure of the inner ear, there is no evidence that low-level infrasound causes this type of direct damage to the ear. So infrasound from wind turbines is unlikely to be harmful in the same way as high-level audible sounds.

The critical issue is that if the sound is detected, then can it have other detrimental effects on a person to a degree that constitutes harm? A major complicating factor in considering this issue is the typical exposure duration. Individuals living near wind turbines may be exposed to the turbine's sounds for prolonged periods, 24 hours a day, 7 days a week for weeks, possibly extending to years.

although the sound level will vary over time with varying wind conditions. Although there have been many studies of infrasound on humans, these have typically involved higher levels for limited periods (typically of up to 24 hours). In a search of the literature, no studies were found that have come close to replicating the long-term exposures to low-level infrasound experienced by those living near wind turbines. So, to date, there are no published studies showing that such prolonged exposures do not harm humans. On the other hand, there are now numerous reports (e.g., Pierpont, 2009; Punch, James, & Pabst, 2010), discussed extensively in this journal, that are highly suggestive that individuals living near wind turbines are made ill, with a plethora of symptoms that commonly include chronic sleep disturbance. The fact that such reports are being dismissed on the grounds that the level of infrasound produced by wind turbines is at too low a level to be heard appears to totally ignore the known physiology of the ear. Pathways from the OHC to the brain exist by which infrasound that cannot be heard could influence function. So, in contrast, from our perspective, there is ample evidence to support the view that infrasound could affect people, and which justifies the need for more detailed scientific studies of the problem. Thus, it is possible that people's health could suffer when turbines are placed too close to their homes and this becomes more probable if sleep is disturbed by the infrasound. Understanding these phenomena may be important to deal with other sources of low-frequency noise and may establish why some individuals are more sensitive than others. A better understanding may also allow effective procedures to be implemented to mitigate the problem.

We can conclude that based on well-documented knowledge of the physiology of the ear and its connections to the brain, it is scientifically possible that infrasound from wind turbines could affect people living nearby.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Bios

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Bob Thorne[1]

Abstract

Human perception responds primarily to sound character rather than sound level. Wind farms are unique sound sources and exhibit special audible and inaudible characteristics that can be described as modulating sound or as a tonal complex. Wind farm compliance measures based on a specified noise number alone will fail to address problems with noise nuisance. The character of wind farm sound, noise emissions from wind farms, noise prediction at residences, and systemic failures in assessment processes are examined. Human perception of wind farm sound is compared with noise assessment measures and complaint histories. The adverse effects on health of persons susceptible to noise from wind farms are examined and a hypothesis, the concept of heightened noise zones (pressure variations), as a marker for cause and effect is advanced. A sound level of LAeq 32 dB outside a residence and above an individual's threshold of hearing inside the home are identified as markers for serious adverse health effects affecting susceptible individuals. The article is referenced to the author's research, measurements, and observations at different wind farms in New Zealand and Victoria, Australia.

Keywords
wind farms, human perception, noise

Wind Farms Are a Unique Source of Noise

Wind farms and wind turbines are a unique source of sound and noise. The noise generation from a wind farm is like no other noise source or set of noise sources. The sounds are often of low amplitude (volume or loudness) and are constantly shifting in character ("waves on beach," "rumble-thump," "plane never landing," etc.). People who are not exposed to the sounds of a wind farm find it very difficult to understand the problems of people who do live near wind farms (Thorne, 2007). Some people who live near wind farms are disturbed by the sounds of the farms, others are not. In some cases adverse health effects are reported, in other cases such effects do not appear evident. Thus, wind farm noise is not like, for example, traffic noise or the continuous hum from plant and machinery. Wind turbines such as those proposed are large noise sources relative to dwellings, and like aircraft, sound emissions are transmitted via the roof and windows. Noise barriers at ground level are generally ineffective in screening or mitigation such sound (Thorne, 2011).

Wind has audible and subaudible characters. That is, measurement of wind sound will always present sound levels in the audible, low-frequency, and infrasonic frequencies. Sound in the low frequencies and infrasound frequencies can be heard if the sounds are loud enough. The sounds, however, may be perceptible rather than heard at relatively lower levels of "loudness."

Evidence produced in New Zealand concerning the West Wind and Te Rere Hau wind farms indicate that the adverse effects of wind farm noise are well documented. West Wind has recorded 906 complaints over a 12-month period. Te Rere Hau has recorded 378 complaints over an 11-month period. Waubra (Victoria, Australia) has a less well documented complaint history but, as recorded in this article, sufficient to identify issues.

Wind farm sound analysis presents three distinct issues:

- The identification of sound that can be directly attributed to the sound of the wind farm turbines, measured as a background sound level, compared with the sound of the ambient environment without the presence of the wind turbines
- The sound of any special audible characteristics of the wind farm turbines, such as distinct tonal complexes and modulation effects (amplitude and frequency) that may affect human health through sleep disturbance, for example
- The presence of any sound characteristics that may affect human health

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Sound from modern wind turbines is primarily due to turbulent flow and trailing edge sound, mechanical sound, and variations in infrasound (air pressure variations). Sound character relates to blade characteristics, blade/tower interaction, and mechanical noise and can be grouped into four main bands. The sound can be characterized as being impulsive and broadband, audible and inaudible (infrasonic):

- Infrasound below 20 Hz (perceptible, normally inaudible)
- Low frequencies, 20 to 250 Hz
- Mid frequency, 250 to 2,000 Hz (broadly, although the higher level could be 4,000 Hz)
- High frequency, 2,000 to 20,000 Hz

Not all these frequencies can be heard by a person with "normal" hearing, as hearing response is unique to an individual and is age dependent as well as work and living environment dependent. It is important to note that infrasound can be "audible" to people with sensitive hearing (Thorne, 2011). Evidence briefly summarized in this article allows the conclusion that there is the potential for adverse health effects for individuals due to wind farm activity while living in their residences and while working on their farms within 3,500 meters of large-scale turbines. Wind farm activity that causes adverse health effects such as sleep disturbance, anxiety, stress, and headaches is a health nuisance, is objectionable, and is unreasonable.

Research indicates that "ordinary" wind has a laminar or smooth infrasound and low-frequency flow pattern when analyzed over short periods of time. Wind farm activity appears to create a "pulsing" infrasound and low-frequency pattern. These patterns are illustrated in sonograms in this article. The hypothesis derived from my research is that wind farm sound has an adverse effect on individuals due to this pulsing nature as well as audible noise due to the wind turbines. These effects may be cumulative.

The Problems With "Noise Numbers" for Wind Farm Noise Assessment

Analysis of "single-value" A-weighted wind farm background levels in the presence of ambient background levels (the real world) is extremely difficult to impossible. This observation is made on the basis of 5 years of monitoring wind turbines at different locales under widely different weather conditions. Figure 1 illustrates the issue: there are the separate sets of sound sources—local ambient, the turbines, and distant sources. It is not possible to separate out the contribution of each source once it is recorded as a single-value (e.g., the "background LA95" sound level or "time-average LAeq" sound level) at a specific location, such as a residence.

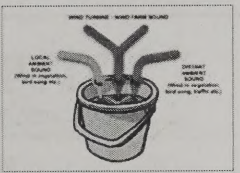
WIND TURBINE / WIND FARM SOUND
LOCAL AMBIENT SOUND (Wind in vegetation, bird song etc.)
DISTANT AMBIENT SOUND (Wind in vegetation, bird song, traffic etc.)

Figure 1. "Bucket of mixed sound" from different sources

By way of example, pour a glass of milk (noise specifically from wind farm activity) into a glass of water (the ambient sound around a residence). Add some extra water for distant sound (wind in trees, distant water pumps, etc.) that affects the background. Now remove the milk. Difficult? Impossible. The three components are completely intermingled. Unfortunately, the example holds true for whatever combination of "single-value" acoustical descriptors are used to describe wind farm mixed with ambient sound levels. A practical alternative is to identify a set of sounds that are specific to the wind farm that are not a characteristic of the receiving environment and reference these sounds. The levels are recorded as, for example, unweighted (Z) sound levels in third octave or 1/12 octave bands. Still difficult, but not impossible.

Obviously, loud levels of sound from a wind farm in excess of LAeq 35 dB may be measurable but still very difficult to prove as being the source of sound when mixed into sound from vegetation (wind in trees, for example).

Conversely, it is easy for people to hear wind farm noise within "ordinary" ambient sound.

It is on this fundamental issue that any standard or condition requiring a wind farm to comply with a specific compliance level will fail. The only possible way is to turn the turbines off, measure the ambient levels, turn the turbines on, measure the wind farm and ambient sound levels together, assess the variation and then come to some decision as to compliance. This procedure only applies to an audit process and fails, of course, if noise complaints are being investigated when the wind farm noise and the ambient sound are completely mixed together and the wind farm sound is not clearly dominant.

The problems with understanding the potential effects of the wind farm start with the sound level predictions often used to assess compliance against some form of guideline or legislation.

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Prediction of Wind Farm Sound Levels

Sound level predictions are not "accurate"; they do not present the sound levels that will be heard at any one location at any one time. Rather, a prediction is a mathematical equation referenced to a lot of assumptions and uncertainties. Because of this, the predicted levels are also "uncertain." The art in prediction is to identify all the assumptions and uncertainties to present a realistic assessment under realistic daily conditions. This is extremely difficult to do and cannot be done with certainty using simple prediction methods such as ISO 9613-2:1996 *Acoustics-Attenuation of sound during propagation outdoors, Part 2 General method of calculation.*

Conversely, the prediction method can be used to provide an indication of expected sound levels over a long term of 12 months, for example.

To gain an initial understanding of the potential noise levels from a wind farm, it is common practice to prepare a noise map of the locality based on the 9 m/s turbine sound power information and residents living in the locale. Noise predictions do not tell the whole story, however. Meteorological conditions, wind turbine spacing, and associated wake and turbulence effects, vortex effects, turbine synchronicity, tower height, blade length, and power settings all contribute to sound levels heard or perceived at residences. In addition to this, the method of prediction has what is known as "uncertainty."

That is, the predicted values are given as a range, ±3 dB(A) at 1,000 meters for the most common prediction method with the predicted value being the "middle" of the range. The uncertainty increases with distance and the effect of two or more turbines operating in phase with a light/strong breeze blowing toward a residence. A variation of 6 to 7 dB(A) can be expected under such adverse conditions. Thus, on any given day the wind farm background LA95 or "source" time-average (LAeq) sound levels—assuming the wind farm is operating—could vary significantly in comparison with the predicted sound level. This is without the additional effect of any adverse wind effects or weather effects such as inversions.

A typical view from a residence toward the nearest towers approximately 1,800 to 2,200 meters to the south is shown in Photo 1. This shows the turbines side-on to the residence. The side-on angle of the blades allows the effect known as vortex shedding affect the residence. If the blades are full-on, as would be the case with a southwest breeze, the residence is affected by cumulative sound as well as wake and turbulence effects. The effects are potentially more noticeable on the land as there is no screening effect from the pressure changes that can occur. The wake effects are observable when the wind blows from one turbine to the other; the effects are not dependent on the direction of the turbines to the observer. The effect of the turbines at night can be seen in Photo 2.

Photo 1. Wind turbines as seen from a residence

Photo 2. Warning lights and visual effects, a local wind farm

Shepherd and Hubbard (1986) suggest that turbines "shift" from line source to point source decay characteristics at a separation distance of approximately 900 meters. Thus, a wind farm can be considered as a discrete line source consisting of multiple sources that can be identified by distance and spacing (blade swish, blade past tower, wake and turbulence interference effects, and vortex shedding). These sources are identifiable (see Photos 3 and 4). The imaging in Photo 3 shows the different sound levels from the blades of the two turbines.

The pattern in Photo 4 shows clearly the vortex shedding from the blade on the downstroke. The dominant source of sound is from the blades with an overall sound variation in the order of 2 dB(A). The measurements are taken at approximately 150 meters behind the turbine. Frequencies below 300 Hz can also be measured.

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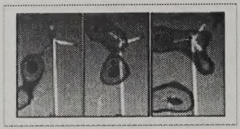

Photo 3. Acoustic photograph of sound sources from two turbines

Source: Acoustic Camera, "Multiple sources wind turbines 300Hz – 7kHz.avi" by permission from HW Technologies, Sydney

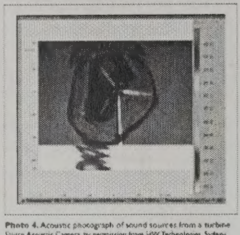

Photo 4. Acoustic photograph of sound sources from a turbine

Source: Acoustic Camera, by permission from HW Technologies, Sydney

Wake effects are always created as highly turbulent air leaving a turbine interacts with lower speed air. A major wind turbine manufacturer recommends a distance of at least 5 rotor diameters between the wind turbines. Wake effects with pockets of lower speed air are present within 3 rotor diameters downwind and mostly dissipated at a distance of 10 rotor diameters. If a second turbine is situated within 10 rotor diameters of the first turbine, the blades of the second turbine can suddenly enter into a pocket of slower air in the wake caused by the first turbine. L. Shepherd (personal communication, 2010) concludes that increased sound levels will occur and the propagation distance in meters to a defined "criterion" or sound level can be calculated.

The vortex travels downwind in the form of a helix, rotating about its axis with each vortex replacing the previous one in space at approximately 1-second intervals—sometimes more, sometimes less depending on the speed of rotation and number of blades. The practical effect is to create heightened noise zones (HNZs).

It is hypothesized that an HNZ is the combined effect of directional sound and vibrations (wave trains) from the towers, the phase between turbines' blades, loading in the air or ground, and interference between turbines' noise (audible) and vibration causing very localized patches of heightened noise and/or vibration. The wave train travels in time and the heightened peaks and troughs create a HNZ at an affected residence. The effect has been consistently measured at a residence 1,400 to 2,000 meters downwind from a row of turbines. The HNZ is directly affected by the design and operation of the wind farm (location and type of turbines, phase angles between blades) and wind conditions. These variables and the effects of wind shear are confounding factors that must also be taken into account when predicting the potential for noise from a wind farm.

The HNZs can be small in extent—even for low frequencies and infrasound—leading to turbine sounds "disappearing" and "appearing" in areas spaced only a few meters apart. The concept of HNZ goes a long way in explaining the problem of wind farm noise and its variability on residents. The other factor is the variability of the background sound levels as affected within the HNZs. The turbine sound levels have the effect of lifting the background (when in phase or acting together). The background drops when in the trough between the crest of the HNZ levels. However, this effect can change quite quickly depending on wind direction, temperature conditions, and turbine activity.

In summary, the prediction of wind farm sound levels at a receiver depends on a whole range of different assumptions and uncertainty, for example:

- The true sound power level of the turbine(s) at the specified wind speed
- The reduction in sound level due to ground effects
- The increase or reduction in sound level due to atmospheric (meteorological) variations and wind direction
- The variation due to modulation effects from wind velocity gradient
- Increase and reduction in sound levels due to wake and turbulence modulation effects due to turbine placement and wind direction
- Increased sound levels due to synchronicity effects of turbines in phase due to turbine placement and wind direction
- Building resonance effects for residents inside a dwelling

Wind farm noise level predictions can therefore be considered as only approximations of sound levels and cannot be given any weight other than this. The reasons are due to the highly complex nature of the sound created by each individual turbine and the cumulative effects of a number of turbines. Unfortunately, noise predictions are often taken as being 100% true by naive approving authorities. This sense is often bolstered by consultants claiming their predictions are "conservative" when in fact they are nothing of the kind. A conservative set of predictions includes all assumptions and uncertainties for different times of day/night, different weather/wind conditions, and the cumulative influence of the whole wind farm.

The situation becomes worse when the predicted levels are referenced to background sound levels as is the case with many wind farm guidelines, standards, and compliance requirements. These conditions are often called "background-plus" criteria where the compliance levels are determined against measured or predicted background sound levels.

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Table 1. Average LA95 Sound Levels Recorded at Residence (Levels Rounded)

Date	LA95 Day, 7 a.m. to 6 p.m.	LA95 Evening, 6 p.m. to 10 p.m.	LA95 Night, 10 p.m. to 7 a.m.
October 15	—	35	—
October 16	37	40	32
October 17	34	32	36
October 18	29	26	27
October 19	29	29	25
October 20	34	31	29
October 21	34	29	31
October 22	30	31	33
October 23	32	25	36
October 24	33	35	26
October 25	38	—	—

Background Sound Levels

Background sound levels are the cornerstone of many acoustical standards dealing with wind farm noise. But what are background levels and how are they measured? Are they constant? Can anyone say with certainty that a background level measured at one location will be the same as in another nearby location? Does the wind affect the levels of background sound? How can wind turbine sound be identified in background sound?

These questions are answered by observations for a case study, "The Dean Report" (Thorne, 2010), taken at two different times in 2009 under different weather conditions. Although the residence is affected by wind turbine noise, a series of ambient and background sound levels were recorded in order to gain an indication of the levels within the locale. Ambient recordings were taken over the period October 15-30, 2009. Ambient A-weighted sound levels were measured generally in accordance with Australian Standard AS1055.1 1997. The ambient sound levels were recorded at 10-minute intervals over a 10-day period (see Table 1). Weather data (wind speed and direction, temperature, and humidity) were recorded for the same time period. Nighttime is recorded as from 10 p.m. the previous day to 7 a.m. on the nominal day.

Table 1 shows the wide range in sound levels at the residence. The levels, at approximately 2,000 meters from the turbines, show the impossibility of determining when or if the wind farm is exceeding a background level of 35 or 40 dB(A). It can be inferred that for some of the time the wind farm is in compliance but at other times it might not. The situation becomes more difficult if there is sufficient breeze to cause a significant lift in background levels.

Finally, if compliance depends on the presence—or not—of audible tones or modulation, then determination becomes near impossible without people to describe the character of the sound. Due to the nature of an operational turbine, modulation is a continuous feature of the wind farm under normal operational conditions—but the sound may not always be audible. In this case the residence is not occupied and the character of the sound—audible modulation in particular—cannot be determined "all the time" on the basis of personal physical observation. The background sound levels are often adjusted for special audible characteristics such as modulation or tonality. Modulation can, however, be determined from sound recordings from a calibrated sound level meter at a relevant time and place investigating the sounds of the wind farm.

The important compliance issue is, "How can special audible characteristics be measured in real time." The answer is, "With difficulty." Either of these two criteria requires full-time real-time monitoring in order for compliance to be proven or not proven at any affected residence.

Sound propagation varies significantly under different wind conditions and influences both the background levels and the character of the sound, especially:

- When there is a strong breeze at the turbines but no or little breeze at the residence
- When the prevailing breeze is blowing from the wind farm to the residence
- Under conditions of cool, clear evenings/nights/mornings when a mist (inversion) covers the ground

This latter condition is sometimes (in Australia) called the "van den Berg effect." It is a common condition and is explained further in this article. My own observations at operational wind farms at distances of around 1,400 meters show that sound levels are higher under calm or inversion conditions (cold clear nights) at the observer than under unstable conditions (e.g., light breeze during the day). Sound levels under inversion conditions are often louder and clearer at observer locations. The effects of temperature inversion in the locale supports inversion (fog) conditions and enhanced and elevated sound levels at the residences are expected. Under stable or inversion conditions sound levels do not decay as quickly compared with unstable conditions.

Thus, the real sound levels from the wind farm may vary considerably within any 24-hour period, due to weather conditions. As with special audible characteristics, measurement

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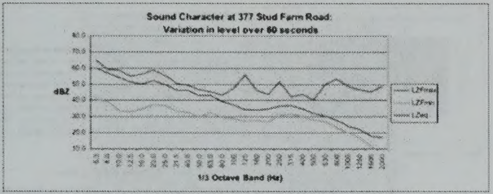

Figure 2. Variation in sound character over 60 seconds

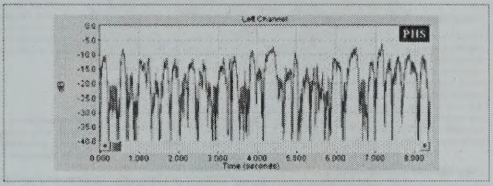

Figure 3. Pulse pattern from an operational wind farm

of wind farm noise for compliance requires full-time real-time monitoring in order for compliance to be proven or not proven at any affected residence. This applies to both audible and inaudible sound.

Audible Sound Character

The operation of the turbines to the southwest of the residence can be clearly heard at the residence. The sound on Thursday evening at 9:40 p.m., October 15, 2009, can be described as a steady rumble with a mixture of rumble-thumps. Wind in the trees or vegetation is not intrusive. Figure 2 presents the variation between maximum, minimum, and average (Leq) unweighted sound levels. Unweighted ("Z" weight sound levels) are referenced to assess the audibility of the sound.

In 60 seconds the sound character varies regularly by more than 20 dB; this level of variation will be audible. The generally accepted variation for a clear sense of audibility is 3 dB. For finer detail is available by analyzing the sound into amplitude variation over the 60 seconds (see Figure 3). The figure shows the regular pulsing or modulation that is typical of blade passing the tower.

The background ambient sound levels for the assessment in Figure 2 references ambient levels recorded at the residence when the turbines were not operating. To confirm that a sound is audible to a person of "normal" hearing, an analysis of broadband sound such as the sounds recorded on the Thursday and illustrated in Figure 2 can be further analyzed for audibility. The higher the orange line is above the green line in Figure 4, the more clearly the signal can be heard. As a guide, a 3 dB shift can be readily heard. The sound is also compared against the hearing threshold level for a "normal" person.

From just this short survey it can be concluded that the wind farm was in noncompliance with a 40 dB(A) background criterion that includes a penalty for special audible characteristics. Sound from wind farms can be easily heard

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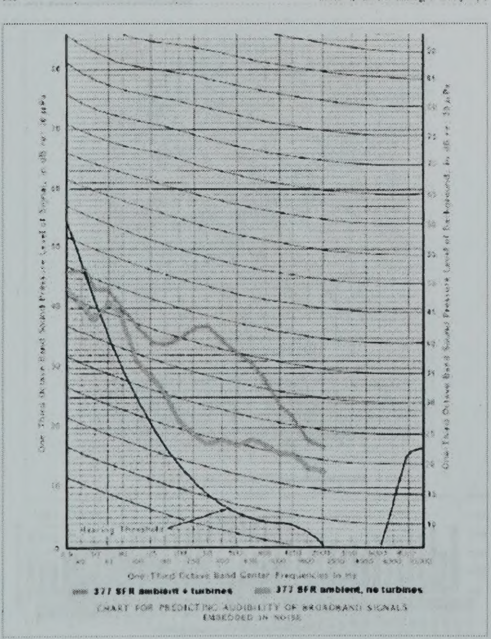

Figure 4. Audibility of wind turbines at a residence

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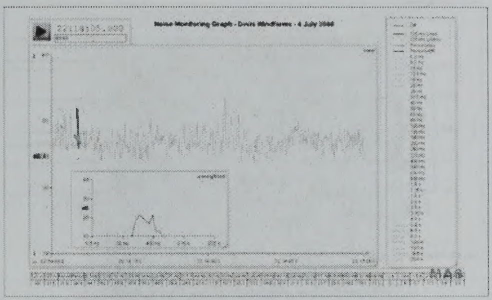

Figure 5. Sound of wind turbines at 930 meters, inside residence

at distances of 2,000 meters; such sound was measured as the background level over the range 29 to 40 dB(A) with conditions of calm to light breeze. The sound was modulating and readily observed and recorded. The sound can be defined as being both unreasonable and a nuisance. But in this case the sound is also causing adverse health effects to exposed residents. It is concluded that the reason for this is the effects of audible nuisance noise and infrasound.

Low-Frequency Sound and Infrasound

The issue of low-frequency sound and infrasound has been a controversial topic for many years. Figure 5 illustrates audible sound as well as both low-frequency and infrasound as heard inside a bedroom approximately 930 meters from a set of wind turbines. The modulating character of the sound is clearly defined in the first 5 seconds as a pattern of three spikes. The chart shows that low levels of sound are clearly audible inside a dwelling. The interior level for the 60 seconds is LAeq 31.6 dB. There are clear and distinctive audible, low-frequency, and infrasound levels. The residents (the United Kingdom) have vacated the dwelling.

In the Waubra case study, the sounds of the wind turbines were recorded at the residence and at the locale. Figures 6 and 7 illustrate the sound levels and character of the sound, including ambient wind, outside the residence. The initial survey was only for the time period 19:40 October 15, 2009, to 01:40 October 16, 2009. The wind dropped after 20:10 and the sound levels decreased.

The outdoor sound levels indicate fluctuating background (LA90, LA95) sound levels with significant variations in the "time-averaged" level, LAeq. The variations are not unusual. The LA95 level for the time period is 33.9 dB(A). The overall sound character shows slight variation between the time-averaged level, LZeq, and the maximum levels, LZmax, in each third octave band. The variation, however, is in the order of 6 dB or more in each band and this is audible.

The initial survey recorded the sound levels inside the residence. Figures 8 and 9 illustrate the sound levels and character of the sound, including ambient wind.

Figure 8 represents a time slice for the beginning of the survey when the sound of the turbines was audible outside. The inside background (LA90, LA95) sound levels are compared with the "time-averaged" level, LAeq. The consistency in level is not unusual for inside a home. The LA95 level for the time period is 17.4 dB(A). The average level is LAeq 32.5 dB. At 8 p.m., the wind dropped and the sound levels within the home decreased, with an average sound level of LAeq 18 dB, just above the background level.

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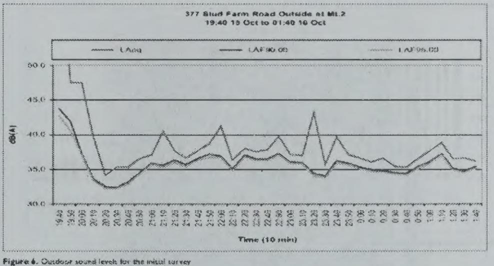

Figure 6. Outdoor sound levels for the initial survey

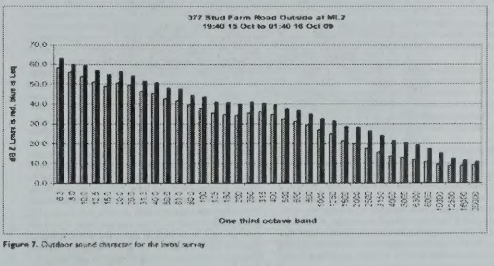

Figure 7. Outdoor sound character for the initial survey

The caution here is that sound levels vary significantly over very short (10 minutes, for example) periods of time. Thus, an assessment on an average longer-term level (Figure 8) may not truly represent the short-term effect of varying sound character (Figure 9).

The observation from Figure 9 is that the overall sound character shows substantial variation between the minimum level, LZmin, and the maximum levels, LZmax, in each third octave band. The variation is significant above 20 Hz because this is when the difference in sound levels becomes audible. The levels show the failure of A-weighted statistical levels in presenting the true sound character.

Sound levels were recorded inside the residence main bedroom over the time period 9:12 a.m. October 12, 2009, to 10:02 a.m. October 13, 2009 (see Figure 10). The wind farm was in operation at this time. The sound levels were

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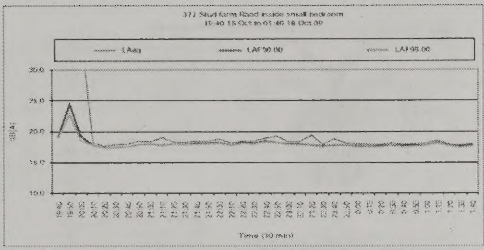

Figure 8. Indoor sound levels for the initial survey

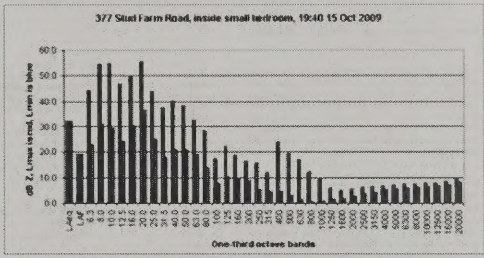

Figure 9. Indoor sound character for the initial survey

recorded in third octave bands every 30 seconds and the average levels for this time period are presented in the following. The SVAN sound level meter is able to record to a lower frequency compared with the Larson Davis 831 meter.

The character of the sound levels is similar to the time-average level *outside*, but there is significant variation between the levels in the two bedrooms. The point is to show that rooms in a residence can and will show significantly different characteristics. What may be inaudible or not perceptible in one room can be easily heard or perceived in another room on the same side of the house. The other concern is that the main bedroom appears to have little sound reduction from outside to inside. The recorded levels are with turbine activity and it is concluded that ambient and wind farm activity will be audible within the bedrooms.

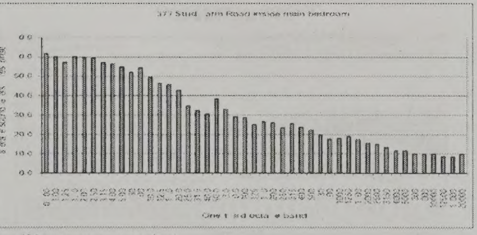

Figure 10. Indoor sound character (main bedroom)

Sonograms are presented to illustrate specific locations with and without turbine activity. The sonograms illustrate the presence of turbines even though the activity may not be audible. Different time segments are used to illustrate the effects. The important features are the following:

- The significant amount of sound energy in the low-frequency and infrasonic ranges.
- The variation of 20 dB between high and low values in the sonograms between the yellow bands and the purple bands. This variation is audible under observed conditions.

The overall levels as one third octave band charts are provided to illustrate the difference between maximum and minimum sound levels in the measurement time period. These correspond to the peak and trough values and give a "first-cut" assessment of whether or not audible modulation, audible tonality, perceptible modulation, or perceptible tonality may exist. Charts are provided as examples of the sound character. The sonograms are taken from recorded audio files that are 60 or 30 seconds in length. Hence, the displayed sonogram charts can differ from the one third octave band charts, which are calculated over a full 10 minutes.

The case study illustrates the difficulties in measuring and assessing wind turbine sound. Sound level criteria referenced to an A-weighted sound descriptor do not accurately describe the sound or perception of a wind turbine or a wind farm.

The study by Thorne (2010) records that wind turbine sound at the residence is perceptible and can be analyzed and assessed in a meaningful way.

The sound character of the wind farm is clearly different from the locale and indicates the presence of modulating sound. The sonograms and third octave band charts presented are provided to illustrate the character of the sound. The method developed by H. Bakker, Astute Engineering, New Zealand (personal communication, 2010) displays sound character, modulation, tonality, or tonal complexes through sonograms. These show sound at various frequencies over time as shown in Plate 1. They can be thought of like a sheet of music or an old pianola roll; the left axis is frequency—musical pitch—while the bottom axis is time. Amplitude and frequency modulation can be identified in the sonograms by distinctive regular patterning at 1-second (or longer or shorter) intervals. Tonality and tonal complexes can also be identified using sonograms. The color indicates the loudness in unweighted dB (SPL) with the color bar at the right providing a key to the "loudness" in decibels associated with each color. The values (−30 to 20, for example) on the right-hand side of the sonogram are decibel levels. Loud notes appear yellow or white; soft notes would appear purple or black. (In these sonograms, much of the color scale has been made black so that peaks stand out better.) Generally, the sonograms are not calibrated against measured sound level but present a comparison between peak and trough (maximum and minimum) levels in a short period of time. At the time of recording it is possible to include reference sound levels in order to assess the sonogram values against measured values.

There are two types of sonograms shown, one is for audible frequencies (20-1,000 Hz) and the other is for low frequencies (0.8-20 Hz), referred to as *infrasound*. The use of sonograms can show the presence of modulation. The rumble/thump of

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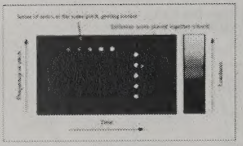

Plate 1. How to interpret a sonogram

wind turbine modulation has been demonstrated to exist in three geographically separate wind farms.

Sound Character at Residence, Plate 2

Plate 2 illustrates the sound of wind farm audible at 7:40 p.m. outside residence, as well as wind in trees, voices, setting-up activity, and a distant vehicle. The sonogram shows a distinctive 50 Hz tone from a nearby electrical source, as well as strong readings at 20 Hz, 16 Hz, and 6.3 Hz. These are indicator frequencies for potential adverse health response. The regular bands or modulations at around 1 Hz indicate wind turbine blade pass frequency. Higher frequency contents (800-5,000 Hz) not evident in the sonogram are evident in the third octave bands.

Sound Character at Residence, Plate 3

The audio file identifies wind and wind farm sounds. There are strong readings at 20 Hz, 16 Hz, and 6.3 Hz. These are indicator frequencies for potential adverse health response. The regular bands or modulations at around 1 Hz indicate wind turbine blade pass frequency. Higher frequency content (800-5,000 Hz) evident in the third octave band chart is not evident in the sonogram. Low-frequency content is evident in both the sonogram and the third octave band chart.

Sound Character at Residence, Plate 4

Wind farm not audible outside residence. The wind pattern is completely different from the previous two sonograms. There is a distinctive 90 Hz tone from an aircraft. Animal and bird noise provide the character. The strong readings at 20 Hz, 16 Hz, and 6.3 Hz have gone. The previous regular bands or modulations at around 1 Hz indicate wind turbine blade noise has gone and instead there are smooth bands of sound from "ordinary" wind flow.

Sound Character Between Two Sets of Turbines, Plate 5

The wind farm was audible at the measurement location as a distant rumble and some of the nearest visible turbines approximately 500 to 1,500 meters distant were moving slowly, as though they were starting up. The sound is similar to an aircraft overhead, although the sound was not from a plane. There are strong readings at 20 Hz and below on a regular basis although there was little or no breeze. The regular bands or modulations at around 1 Hz indicate wind turbine blade pass noise.

Sound Character Inside Residence, Plate 6

Sound levels measured inside a small bedroom. The audible sound character (200-400 Hz) is from distant voices within the house. Wind farm not audible outside residence; turbines to the north turning slowly, turbines to the south not turning. There are strong readings at 20 Hz and below on a regular basis. There was no ground-level breeze outside during the recording. There is evidence of normally nonperceptible infrasound and audible midrange frequencies within the bedroom.

Responses of Residents Living Near Wind Farms

Community noise exposure is commonly measured in terms of a noise exposure measure. Noise exposure is the varying pattern of sound levels at a location over a defined time period. The time period is most often 1 day (short term) or over weeks, months, or a year (long term).

The practical difficulty in locale measurements is that many of them are needed to describe a neighborhood. It is customary, therefore, to use a suitable single-number evaluation for community neighborhood noise exposure. Individuals, however, are different in their tolerance to specific sounds; there is a distinct duration-intensity relationship that varies depending on the character of the sound (Thorne, 2007).

There is no defined relationship that can predict when a noise is reasonable or unreasonable; for this to happen, the sound must be audible or perceptible to cause an adverse response in the person affected.

Previous wind farm investigations in New Zealand and Victoria, Australia, indicate that residences within 3,500 meters of a wind farm are potentially affected by audible noise and vibration from large turbines, such as those proposed. Residences within 1,000 to 2,000 meters are affected on a regular basis by audible noise disturbing sleep. Adverse health effects are reported and as these effects did not occur before the wind farms became operational a reasonable hypothesis is that the wind farm activity has a causal relationship (Thorne, 2007, 2011).

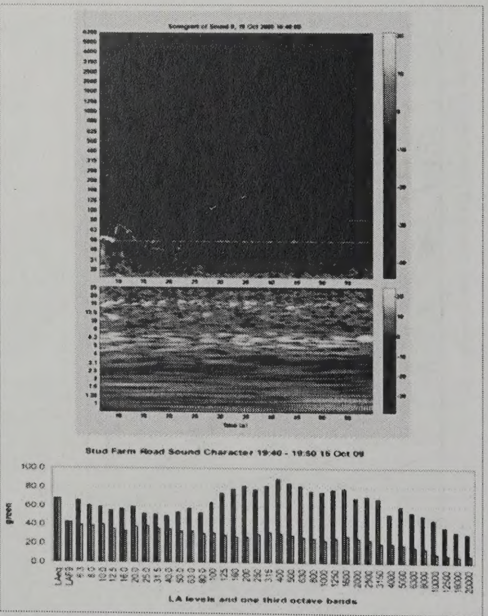

Plate 2. Sound of wind farm audible outside residence

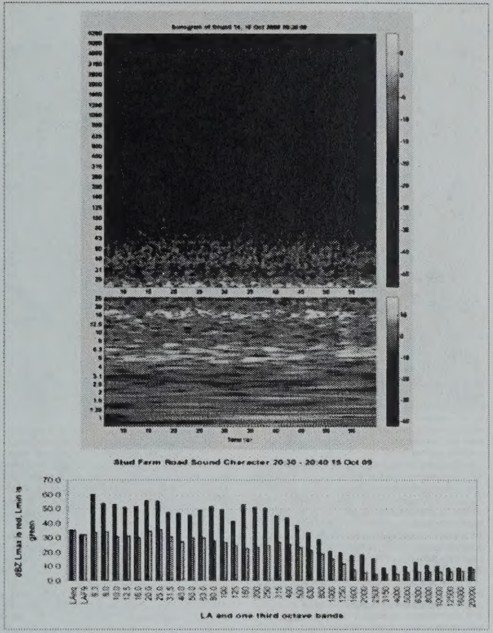

Plate 3. Sound of wind farm audible outside residence (low frequencies identified)

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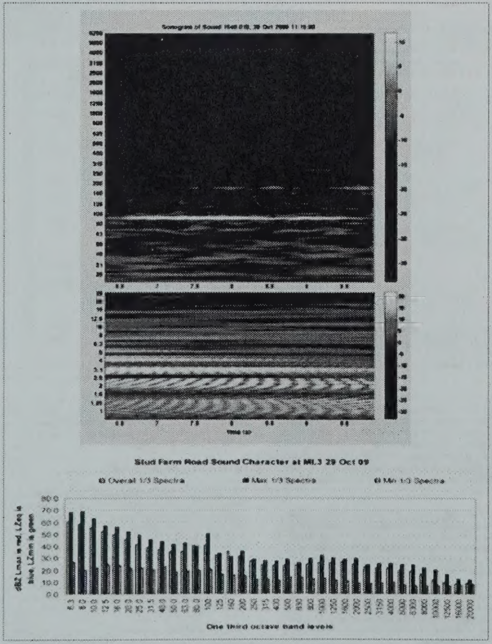

Plate 4. Sound of wind farm not audible outside residence

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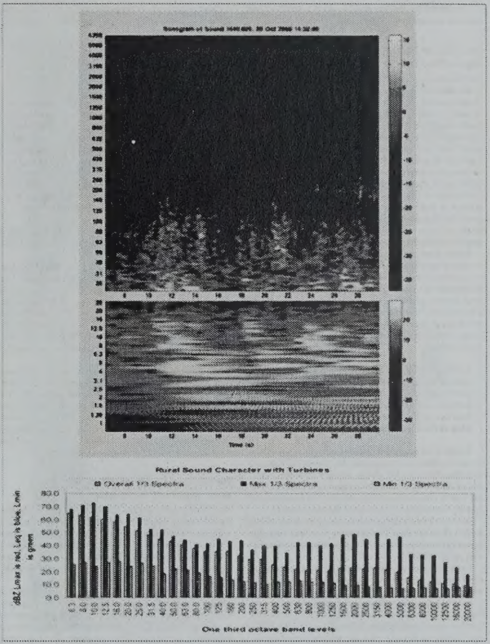

Plate 5. Sound character of wind farm turbines

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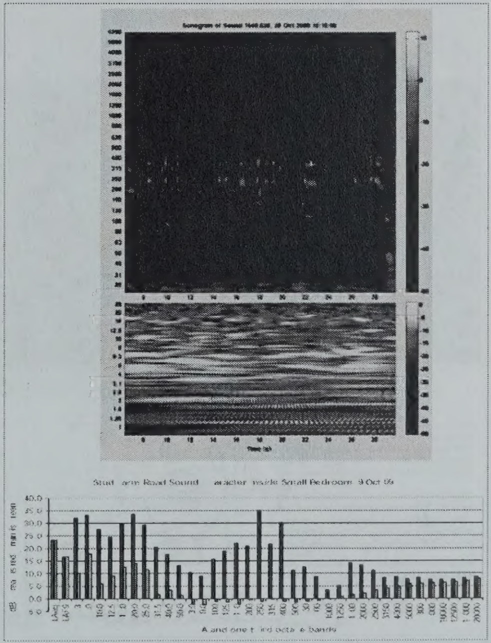

Plate 6. Sound character of wind farm inside a dwelling

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The following three examples illustrate the effects of wind farms on residents living within the locale.

The Effects on People Living Near the Waubra Wind Farm, Victoria, Australia

The Waubra wind farm commenced operation in March 2009 in the Ballarat section and in May 2009 in the northern Waubra section. Within a short time nearby residents were becoming concerned about noise. By August 2009 adverse health effects were being reported. In September-October I interviewed five different families near the northern section of the wind farm, all of whom indicated some adverse reaction since the commissioning of a nearby wind farm earlier in the year. The families are all within approximately 1,000 to 2,000 meters of turbines and had at least two sets of turbines near to them. Under these circumstances, the residences are affected by wind farm activity over a range of wind directions. The interviews were preliminary in nature and standard psych and noise sensitivity tests were not conducted, nor were detailed health notes recorded.

Family A indicated headaches (scalp and around the head pressure), memory problems, and nausea when the turbines are operating. Symptoms include an inability to get to sleep and sleep disturbance, anxiety and stress, pressure at top and around head, memory problems, sore eyes and blurred vision, and chest pressure. When the turbines are stopped the symptoms do not occur. A difference in severity is recorded with different wind directions. A personal comment made states the following:

> I am having problems living and working indoors and outdoors on our property . . . problems include headaches, nausea, pain in and around the eyes, sleep disturbance, pain in back of head; we feel this is coming from generation of wind from wind farm as it is OK when turbines are stopped.

Family B indicated tinnitus, dizziness, and headaches since the turbines have started operating. The family also indicated sleep disturbance at night with the sound of the turbines interrupting sleep pattern, vibration in chest at times, and tiredness and trouble concentrating during the day. The family did not have problems sleeping when not at Waubra overnight.

Family C indicated that the noise coming from the turbines at night disturbed sleep. During the day there was noise that causes bad headaches, sore eyes causing impaired vision, earache, and irritability.

Family D indicated suffering from sleep disturbance, headaches, nausea, and tachychardia (rapid heart rate) since the turbines started operating.

Family E indicated that when the turbines were operating symptoms included feeling unwell, dull pains in the head (acute to almost migraine), nausea, and feeling of motion sickness. Symptoms at night when the turbines were in motion included sleep disturbance from noise and vibration (unable to get any meaningful deep sleep) and sleep deprivation leading to coping problems. The problems were reported as follows:

> Some days when the wind is in the north-east my eyes feel swollen and are being pushed out of the sockets. I have a buzzing in my ears. On these days I feel it very difficult to summon memory and difficult to concentrate.
>
> The sound of the turbines when functioning is on most days so intrusive that it affects my concentration and thought processes when performing complex tasks. I suffer from sleep interruption as a direct result of the noise, which then affects my ability to function at 100% the following day. One is aware of a throbbing in the head and palpitations that are in synchrony with the beat of the turbines and to a degree the flashing of the red lights. Because of this impact on my everyday life it causes me great stress and in turn great irritability.

Two families identified blade glint/flicker and the red warning lights on the top of each tower as an additional source of annoyance.

Statutory declarations (June 2010) concerning noise issues have been declared by residents affected by the Waubra wind farm. Noise from the turbines is being experienced by residents within approximately 1,000 meters of the nearest turbines and at distances of approximately 3,000 to 4,000 meters distant from the nearest turbines. The locales where the residents experience noise are shown in Plate W1. The noise and health effects experienced by residents are presented in Table W1.

The Waubra north and Ballarat locales are rural in nature with relatively low hills and rolling countryside. The northern section of the wind farm is illustrated in Plate W2. The locale is affected by southwest winds at turbine level but can be relatively calm at residences. The prevailing winds at Ballarat airport are shown in Figure W1. The measured wind directions are given to illustrate the importance of accurate wind data in predicting or assessing complaints.

The Effects on People Living Near the "West Wind" Wind Farm, New Zealand

The "West Wind" wind farm commenced operation in May 2009. From my observations at Makara, New Zealand, at a residence situated approximately 1,200 to 1,300 meters from 5 turbines and within 3,500 meters of 14 turbines there is known probability that the wind farm will exhibit adverse "special audible characteristics" on a regular basis resulting in sleep disturbance, annoyance, and stress.

The observations and measurements being recorded at Makara involve the residents taking notes of the noise heard when they are awakened. At the same time, a fully automated monitoring system records exterior audio as well as exterior and interior sound level data in summary levels and third octave band levels. This allows the generation of tracking data and sonograms for compliance and unreasonable noise assessment. The complaint data are retained by the City Council. Statistical data are retained by the wind farm operator and summarized for the Council. Audio data for real-time analysis of special audible characteristics are not recorded by either the Council or the wind farm operator. Audio data are recorded, however, by one affected resident.

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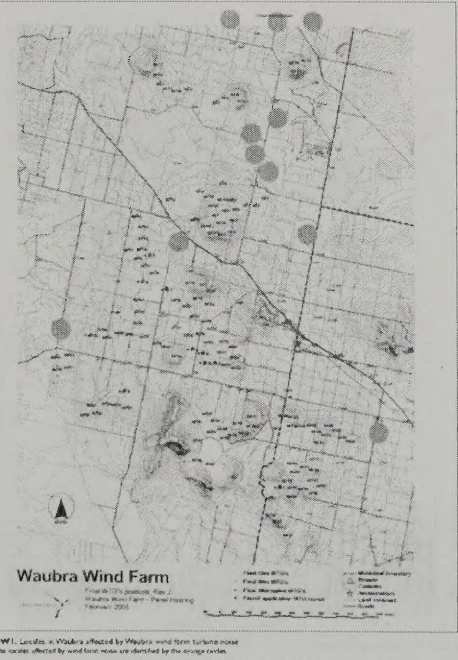

Plate W1. Locales in Waubra affected by Waubra wind farm turbine noise
Note: The locales affected by wind farm noise are identified by the orange circles.

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Table W1. Waubra Wind Farm Perception and Complaint Analysis

Locale	Distance	Effects of Noise
1	1,500-2,500	Sleep disturbance, headaches, affects eyes and back of head, tinnitus. Worst affect is while working the farm. Heart pressure changes.
2	1,000	Sleep disturbance, headaches, high blood pressure.
3	1,000-1,300	Sore eyes and headaches when the turbines are operating.
4	1,250-3,000	Sleep disturbance. Affects people working on the farm. Headaches, earaches, blood pressure changes, and poor eye sight.
5	1,300-2,200	Insomnia, headaches, sore eyes, dizziness, tinnitus, and heart palpitations. Deteriorating health due to lack of sleep and stress levels. Unable to sleep through the night. Affects while working outside on the farm.
6	2,000-2,300	Headaches and pressure in ears when working on the farm.
7	550-1,400	Sleep disturbance, windows vibrate. Affects while working on the farm. Headaches, lack of sleep, major problem with flicker. Excessive noise under a strong southwest wind.
8	1,000-3,500	Headaches when working farm within 1500 meters of turbines. Dizziness when two turbines inline and in sync, affect worst when approximately 300 meters out of alignment. Sleep awakenings and disturbed by pulsating swish. Heart palpitations, vibrating sensation in chest and body. Headaches while at home. Stress and depression.
9	3,500-4,300	Frequently suffer from headaches, tinnitus, irritability, sleepless nights, lack of concentration, heart palpitations. Turbines exhibit a loud droning noise and pulsating whoosh.
10	3,400-3,800	Headaches, ringing in ears when turbines are operating. Pressure in ears, heart palpitations, and anxiety attacks. Awaken at night, sleep disturbance.
11	3,000-4,600	Elevated blood pressure, heart palpitations, ear pressure and earache, disrupted sleep, increasing frequent headaches, head pressure, vibration in body, mood swings, problems with concentration and memory. Awaken at night, sleep disturbance.
12	1,000-1,200	Headaches, sickness, frequent sleep disturbance, very stressed. Affects personal life. Lights on turbines cause extreme distress. Ear pressure and loss of balance while working on the farm. Enormous pressure and stress on home and work.

Note: "Distance" is the distance in meters between the locale and the nearest turbines. The distances vary where turbines are in different directions surrounding the locale. Each locale contains one or more affected families. A common observation is that the adverse health effects noted did not exist before the wind farm commenced operation or diminish/disappear when not in the district affected by turbines.

In the period April 2009 to March 31, 2010, a total of 906 complaints were made to the Wellington City Council, New Zealand, concerning noise from the wind farm at Makara. These complaints were made by residents living near to and affected by the wind farm. An analysis of the complaint history was made by acoustical consultants working for the wind farm company. From 64 households in a population of approximately 140 occupied residences, 57% of the complaints were from 10 households and 79% were from 20 households.

The character of the 650 complaints was sorted by an independent researcher. Rumble, with 252 mentions, was the most common characteristic. Hum and thump are the next most common annoying sounds. In comparing complaints of noise outside to inside, of 650 complaints, only 23 specifically mentioned the noise as being outside.

In personal interviews at Makara, some residents identified nausea as a problem. In the most severely affected cases known, the residents have bought property and moved away from their farm.

Low-frequency sound and infrasound are normal characteristics of a wind farm as they are the normal characteristics of wind, as such. The difference is that "normal" wind is laminar or smooth in effect whereas wind farm sound is non-laminar and presents a pulsing nature. This effect is evident even inside a dwelling and the characteristics are modified due to the construction of the building and room dimensions. Of the indoor complaints, 45% specifically mentioned sleep disturbance.

The Makara complaints were limited to a small locale. Complaints were from the whole of the district, that is, a distance of approximately 12 km. The turbines are situated in both clusters and rows. The locale "Makara" is a small village and school affected by a cluster of approximately 14 turbines within 2,000 meters; the locale "South Makara" is a line of residences facing a line of 25 turbines within 2,000 meters over approximately 5 km. The issue is that turbine noise is known, it can be defined by character and distance, and it does have significant impact on a large number of people.

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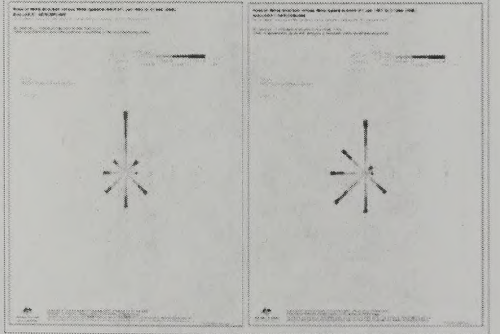

Figure W1. Wind rose, Ballarat Aerodrome, mid-morning and mid-afternoon

The turbines are Siemens 2.3 MW machines situated approximately 1,200 to 2,200 meters from residences.

Nausea and sleep disturbance were reported by one visitor to a residence 2,700 meters from the nearest turbine. The residents also complained about the visual nuisance caused by blade glint and flicker, as well as the red glow from the warning lights on top of each tower. A complaint (March 2010) about the operation of the wind farm expressed the following:

> We have had a persistent level of disturbance noise now for several hours throughout the evening that is now preventing us sleeping since 11:15 p.m. The predominant noise is a continuous loud booming rumble that is even more noticeable after a gust at ground level. When the wind noise drops, the background noise from the turbine continues and is also felt as a vibration being transmitted through the ground. Even with wind noise the vibrations in the house continue. The varying wind speed also causes a beating noise from the blades that occurs in cycles creating yet another form of noise disturbance.

A second resident said the following:

> We are 2 km away to the east and the thumping also penetrates our double glazing. The reverberation is somehow worse inside the house.

And a third resident said the following:

> We . . . get the low-frequency thump/whump inside the house, is very similar to a truck driving past or boy racers sub woofer 100 meters away . . . we have no line of sight turbines and the closest one in 1.35 km away. There are however 27 turbines within 2.5 km (which would apply for the whole village). The sound is extremely "penetrating" and while we have a new house with insulation and double glazing, the low-frequency modulation is still very evident in the dead of night. It is actually less obvious outside as the ambient noise screens out the sound.

The valley is affected by strong winds at turbine level but can be relatively calm at residences. The prevailing wind at

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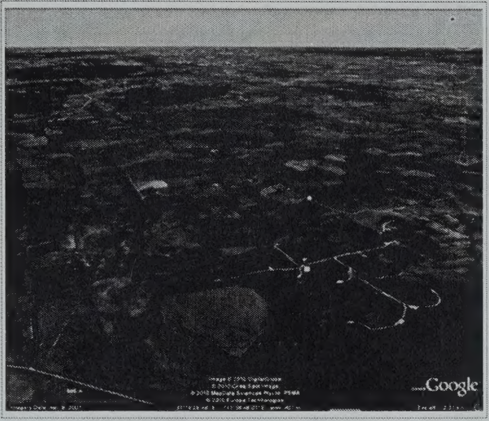

Plate W2. North Waubra locale, residents and the Waubra wind farm.

the turbines' mast at 40 meters above ground is shown in Figure WW1. The measured wind directions are given to illustrate the importance of accurate wind data in predicting or assessing complaints.

The Effects on People Living Near the "Te Rere Hau" Wind Farm, New Zealand. In the period from May 2009 to March 31, 2010, a total of 378 complaints about noise were made to Palmerston North City Council, New Zealand, concerning the Te Rere Hau wind farm. The complaints were made by persons within approximately 2,300 meters south, 3,100 meters southwest, and 2,100 meters to the north of the center of the "97"-turbine wind farm. Complaints concerned both the loudness and character (grinding, swishing) of the sound from the turbines, a two-blade 500 kW design.

The Te Rere Hau wind farm complaints are important as they reflect the concerns of a rural community with relatively few people living within 3,500 meters of the center of the wind farm. Te Rere Hau is a densely packed design with wind turbines arranged in a grid pattern. In the 10 months for which records have been seen, 21 different residents complained about noise, with 2 residents logging more than 40 complaints each and a further 8 logging more than 10 complaints each. This indicates issues with wind farm placement and design that can be mitigated by careful consideration of turbine choice, turbine siting design, and

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Table WW1. West Wind Perception and Complaint Analysis Till November 2009

Locale	Distance	Effects of Noise
1	1,200-1,300	Kept awake with turbine noise pulsing in bedroom. Sleep disturbance. Sounds not masked by wind in trees or stream.
2	1,200-1,300	Possible to hear and feel the turbines (20 of them) over usual household noises during the day and evenings. At night disturbs sleep patterns and affects health and well-being. Can hear the noise through the bed pillow. Sounds like a tumble dryer.
2	1,200-1,300	Can hear the turbines inside and outside the house during the day and at night. Disturbs sleep and affects health (tiredness). Family is stressed.
3	1,700	Sound is a rhythmic humming heard inside and outside the house during the day and at night. Northwest wind brings noise, southerly does not. Noise is highest when it is calm at the house but windy at the turbines. Turbines audible inside the home with TV on. Noise is a low hum.
4	1,750	When the wind is from the north to northwest the noise penetrates into the home. Persistent deep rumbling around 1-second interval and lasts for 10 to 20 seconds and then abates. Awakens and disturbs sleep. Generates annoyance and irritability.
4	1,700	Disturbs sleep. Turbines are heard when it is calm at the house and windy at the turbines. Annoyance, nausea, earaches, and stress.
5	2,100	Turbines audible in bedroom. Awaken and disturbs sleep. Creates pressure in head and headache. Feeling tired and distressed.
6	2,000	Northwest wind brings noise and disturbs sleep.
7	1,250	Northwest sound is constant thumping, pulsing. Cannot stand being in the house or around the property; sick feeling, headaches, tight chest. Can be heard at night cannot sleep, get agitated, and wound-up. Has ruined peace and tranquility.
7	1,250	Northwest wind, mild to wild, sound is constant thrumming. Noise is intensified in the house and more noticeable at night. Feeling of nausea precludes sleep. Disturbed and sleepless nights.
8	1,500-2,000	Turbine noise heard within the home. Severe sleep deprivation from interrupted sleep and lack of sleep. Fear of causing an accident on the farm due to lack of sleep. Noise at night is a southerly with a grinding rumbling sound. Noise from the northwest grinding a "plane takeoff" noise. Lot of ringing in ears. Easily heard above the background noise. Depression due to noise at night and lack of sleep.
9	750	Noise from the southerly winds rumbling, grinding all day and night. Trouble sleeping.
10	2,200	Regular sleep disturbance, sound like a plane. Louder inside the home than outside. Northwest wind thumping or rumbling sound, noise and vibration in the home (double glazed). Headaches. Low-frequency humming. Awakenings and sleep deprivation.

Note. "Distance" is the distance in meters between the locale and the nearest turbines. Each locale contains one or more affected families.

consideration of neighbors and long-term meteorological conditions. Plate TRH1 presents the impact of the wind farm on nearby residences. The number of complaints lodged by the residents is indicated in the plate. Table TRH1, for a single residence, illustrates the common thread of the noise problems found and the relationship to weather conditions. The residence is approximately 1,200 meters from the nearest row of wind turbines. The position of the wind farm on a plateau above the residences is illustrated in Plate TRH2. The measured wind directions are given in Plate TRH3 and illustrate the importance of accurate wind data in predicting or assessing complaints. The complaint numbers are very high for wind farms that supposedly are complying with their approval conditions. While the background levels may be achieved and this has yet to be proven, the wind farms are a significant source of unreasonable noise. The number and history of the complaints emphasizes the importance of buffer zones and wind farm design so noise can be mitigated by careful consideration of turbine choice, turbine placement, consideration of neighbors, and long-term meteorological conditions.

Real-World Noise Compliance Problem at a Wind Farm

The Te Rere Hau wind farm in New Zealand is presently the subject of a legal review of its compliance and the methodologies applied to measure background sound levels and compliance levels (*PNCC v. NZ Windfarms*, 2010). In brief, it is understood that specific issues raised are the following:

- The Te Rere Hau wind farm is being operated at levels higher than those predicted in the (wind farm) application
- The respondent has substantially underestimated the effects of the wind farm noise on the amenity of the area
- The AEE concluded noise from the wind farm would not exhibit special audible characteristics (i.e., clearly audible tones, impulses, or modulation of sound levels). This conclusion is inaccurate [reasons given]

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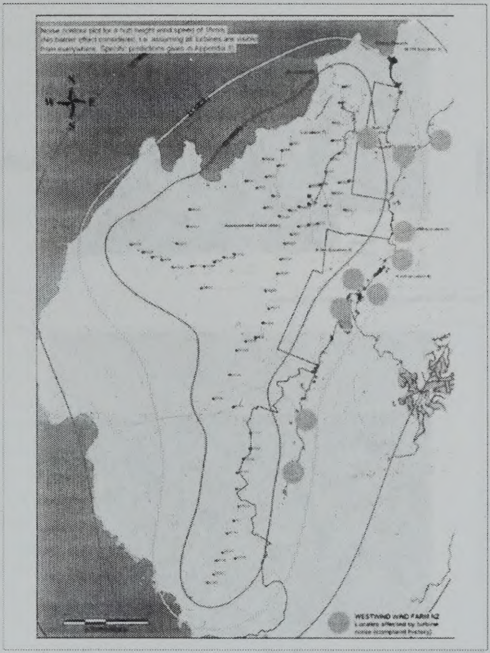

Noise contour plot for a hub height wind speed of 9m/s
(No barrier effect considered, i.e. assuming all turbines are visible from everywhere. Specific predictions given in Appendix 3)
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Locales affected by turbine noise (complaint history)

Plate WW1. Locales in Makara affected by "West Wind" wind farm turbine noise

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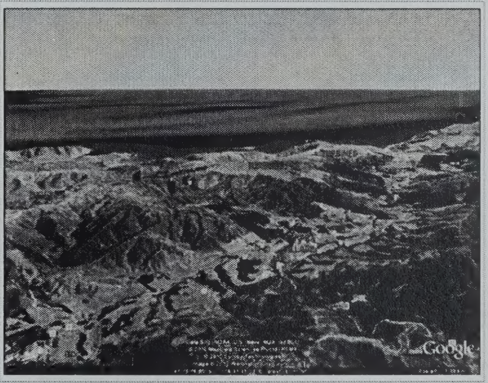

Plate WW2. Makara Valley residents and the "West Wind" wind farm

Note. The turbines (marked in red) are situated on the top of the ridge and the residents are in the valley (Makara Village and blue squares)

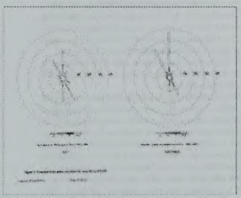

Plate WW1. Prevailing winds for Makara at the wind farm mast (40 meters)

- The actual experience of residents (located up to 2.18 km from the nearest turbines) and the number of complaints made to the Council indicating there are noise effects (which also exhibit special audible characteristics) being experienced at a significant number of local properties
- The actual results reported in the revised compliance report (April 2010) demonstrate the actual sound levels from the wind farm are significantly higher (up to 12.8 dBA higher) at the monitoring location under certain wind speeds and directions than predicted
- While monitored noise included noise from all sounds in the area (not just wind farm noise), the uncertainty as to the actual wind farm noise levels warrants further investigation. A new noise testing specification is the subject of the memorandum of December 21, 2010.

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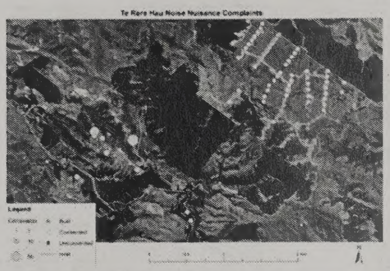

Plate TRH1. Te Rere Hau wind farm complaints by location

Plate TRH2. Te Rere Hau wind farm in relation to residences

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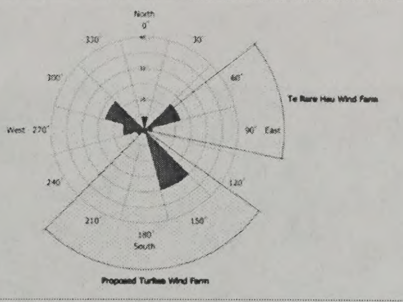

Figure TRH1. Wind Rose for May to September 2009 illustrating existing wind farm (Te Rere Hau) and effect from a proposed wind farm (Turitea) to the south

Conclusions

Personal perception of a sound is investigated through assessment of personal noise sensitivity, personal perception of the characteristics of the sound, and observable adverse health effects. Noise includes vibration in any form that can be "felt" by a person. There is, despite the differences in opinion as to cause, considerable agreement between the parties—residents, clinicians, and acousticians—as to observable health effects from unwanted sound. There are clear and definable markers for adverse health effects before and after the establishment of a wind farm and clear and agreed health effects due to stress after a wind farm has started operation. It is the mechanism of the physical or mental process from one to the other that is not yet defined or agreed between affected persons, clinicians, and psychoacousticians.

- It is concluded that, for the reasons given in this article, compliance criteria of a single value, such as 35 dB(A) measured as the equivalent level, LAeq, 40 dB(A) measured as the background level, LA95; or the "background plus 5dB" sound level, whichever is the greater are not acceptable. This is due to the general failure of approval conditions to provide clear and specific methodologies to measure wind farm sound under compliance testing conditions or under complaint conditions when turbine sound is part of the ambient sound.
- It is concluded that wind farms exhibit special audible characteristics that can be described as modulating sound, impulsiveness, or as a tonal complex. Compliance monitoring must include real-time measurement of special audible characteristics and infrasound.
- It is concluded that frequent short-term variations in air pressure (infrasound) may lead to adverse health effects in individuals.
- It is concluded that meteorological conditions, wind turbine spacing, and associated wake and turbulence effects, vortex effects, wind shear, turbine synchronicity, tower height, blade length, and power settings all contribute to sound levels heard or perceived at residences. Current noise prediction models are simplistic, have a high degree of uncertainty, and do not make allowance for these significant variables.
- It is concluded that noise numbers and sound character analyses are meaningless if they are not firmly linked to human perception and risk of adverse effects.

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Table TRH1. Te Rere Hau Noise Complaints, August 2009 to February 2010, Single Residence

Date and Time	Wind Direction	Complaint
07/08/09, 5.45 p.m.		Noise from wind farm
20/08/09 6.55 a.m.	South-southeast	Wind farm loud this morning
20/08/09, 8.45 a.m.	South-southeast	Loud wind mills at 5.00a.m.
21/08/09, 6.32 a.m.	East	Wind farm noise
22/08/09, 12.51 p.m.	East	Medium strength, swooshing, and grinding, only ½ on
29/08/09, 8.45 a.m.	West	Very loud again today
15/09/09, 6.21 p.m.	East	Loud noise coming from wind farm
11/05/09, 10.48 a.m.	West	Light wind, wind farm extremely loud
21/11/09, 5.42 a.m.	West	WF too loud
09/08/09, 7.03 a.m.		Noise from Te Rere Hau this morning
09/08/09, 6.02 p.m.		Excessive noise Te Rere Hau
31/08/09, 1.03 p.m.		Windmills beeping noise every 2 minutes
04/09/09, 8.05 a.m.	East	Continuous noise last half hour
09/09/09, 11.24 a.m.	West	Started turbines 103 and 104, now noisy
11/09/09, 6.21 a.m.	North	Light northerly, noise since he got up
19/09/09, 10.49 a.m.	South	Very noisy again today
20/09/09, 8.13 a.m.	East	Loud noise
28/09/09, 7.15 a.m.	Northeast	Wind farm noise
07/10/09, 5.32 p.m.	West	Light wind, loud noise from wind farm
08/10/09, 7.42 a.m.	West	Light wind, swooshing noise this morning
09/10/09, 7.02 a.m.	Northeast	Light wind, wind farm really loud this morning
10/10/09, 9.59 a.m.	South	Light wind, would like to complain about noise
12/10/09, 7.48 a.m.	North	Light wind loud noise from wind farm
20/10/09, 3.53 p.m.	South	Loud noise at wind farm
08/11/09, 9.36 a.m.		Still, noise today
16/11/09, 7.25 a.m.	West	Lots of noise coming from wind farm this morning
17/11/09, 6.27 p.m.	West	Light wind, very loud tonight
20/11/09, 7.22 a.m.	West	Noise complaint
22/11/09, 7.16 p.m.	East	Light wind, wind farm very noisy
04/12/09, 6.18 a.m.	West	Noisy this morning
07/12/09 6.21 p.m.	West	Loud wind farm
09/12/09, 6.50 a.m.	West	Light wind, droning noise
15/12/09, 7.28 a.m.	South	Noisy wind turbines
19/12/09, 7.04 p.m.	West	Light wind noise from turbines over days whirring
25/12/09 8.59 a.m.	West	Light westerly, very loud today
16/01/10, 9.09 a.m.		Noise
17/01/10, 7.44 a.m.	South	Light-medium southerly wind farm quite loud today
17/01/10, 6.58 p.m.	South	Southerly wind, wind mill noise
18/01/10, 7.26 a.m.	Southeast	Medium wind, wind turbine noise last hour
18/01/10, 6.45 p.m.	East	Noise very bad
18/01/10, 10.54 p.m.	Southeast	Extremely loud
19/01/10, 7.28 p.m.	West	Turbines causing a lot of noise tonight
21/01/10, 8.21 p.m.	East	Loud noise from the turbines
25/01/10, 4.43 p.m.	East	Wind mill noise
26/01/10 8.12 a.m.	East	Medium wind, wind turbines making a lot of noise
28/01/10, 7.27 p.m.	East	Light wind, turbines are noisy again this evening
29/01/10, 10.21 a.m.	East	Loud noise from blades and mechanical noise
29/01/10, 6.12 p.m.	East	Med wind same noise as usual coming from turbines
02/02/10, 6.51 p.m.	East	Loud noise from wind farm
03/02/10, 7.19 p.m.	East	Noise from wind farm
04/02/10 7.01 a.m.	East	Noise loud this morning
05/02/10, 6.22 a.m.	East	Light, loud today
05/02/10, 5.57 p.m.	East	Light wind, same whirring gearbox noise as usual
07/02/10, 12.45 p.m.	Northwest	Excessive noise
08/02/10, 6.58 a.m.		Wind farm very loud this morning
08/02/10, 8.16 p.m.	East	Light wind
10/02/10, 7.11 a.m.	North	Te Rere Hau noisy this morning
15/02/10, 8.14 p.m.	East	Medium wind
16/02/10, 7.50 a.m.	East	Turbine noise in east direction at least hour

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- It is concluded that no large-scale wind turbine should be installed within 2,000 meters of any dwelling or noise-sensitive place unless with the approval of the landowner.
- It is concluded that no large-scale wind turbine should be operated within 3,500 meters of any dwelling or noise-sensitive place unless the operator of the proposed wind farm energy facility, at its own expense, mitigates any noise within the dwelling or noise-sensitive place identified as being from that proposed wind farm energy facility to a level determined subject to the final approval of the occupier of that dwelling or noise-sensitive place.

In my opinion, based on my training, experience, measurements, and observations, serious harm to health occurs when a susceptible individual is so beset by the noise in question that he or she suffers recurring sleep disturbance, anxiety, and stress. The markers for this are (a) a sound level of LAeq 32dB outside the residence and (b) above the individual's threshold of hearing inside the home.

Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Bio

Bob Thorne, MSc, PhD, is the principal consultant of Noise Measurement Services Pty Ltd, Brisbane, Australia. He holds a PhD from Massey University, New Zealand, in health science and is an environmental health research associate in the Institute of Food, Nutrition and Human Health at Massey University. His research work involves using advanced specialized technology for intrusive noise assessment, and a specific application is personalized sound reinforcement for hearing assistive devices.

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From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Tuesday, June 28, 2011 5:59 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Correction

The sites that I visited were located between Painted Gorge Road and West to Sugarloaf in the Ocotillo area. P171-01

Thank you; Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Thursday, August 25, 2011 9:12 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Mr. Perry

My name is: Parke Ewing (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca, 92259

I attended the Meeting concerning the proposed Ocotillo Wind Energy Project in Ocotillo, August 25th, 2011.
I was very disappointed that public comments were not allowed at this very important meeting. Jeff Childers, (with the BLM) spoke tonight emphasizing how much our comments were needed to finalize the EIR/RIS. Many people drove over 100 miles from San Diego and other communities to verbally comment on this desert destroying project and the no verbal comment ruling was very disheartening to say the very least. BLM representative spoke, Pattern Energy spoke, no public comments, not fair. It would have been a great opportunity for representatives of the Bureau of Land Management and the Imperial Valley Planning Department to actually put a face on all of the written comments that you will receive concerning this project. This meeting would also have allowed the people of Ocotillo a chance to hear other comments from concerned citizens that may affect their future lives in this small community. We feel that we are being run over by big bureaucracy and big business. Tonight's meeting comments would have helped us believe that our government actually cares about us and that our comments will make a difference. Again, we are very disappointed in the bureaucracy. Our verbal comments should have been heard. **P172-01**

Very Sincerely: Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Thursday, August 25, 2011 9:39 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Mr. Perry:

My name is: Parke Ewing (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

My 13.5 acre parcel of land and home are located .4 miles East of the Ocotillo Community Park. Our home was situated on our property to fully take advantage of our magnificent views of the Coyote Mountain Range directly to our North. Wind generators with heights of 448' tall, equal to a 44 story building will significantly block our views. We purchased land, built our home knowing that zoning in this area would not allow blockage of our views due to height limitations. We adamantly oppose zoning changes and we adamantly oppose these structures.

P173-01

If this project is allowed to be constructed, we demand reimbursement of all labor and material costs that we have invested in our dream home and property. Please note that your draft EIR/EIS has stated that the property values have declined in Ocotillo, while property values have increased in El Centro. I can only summarize that due to the proposed wind generator project, our property values have plummeted. After all, wind generator projects don't attract homes and home buyers. They only seem to attract wind energy investors.

Very sincerely: Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Thursday, August 25, 2011 10:37 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Facility

My Name is: Parke Ewing (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Re: 7.0 Proposed Project Trip Generation/Distribution/Assignment

The analysis of employee truck trips per day in the Ocotillo area is not "clearly" stated. Please clarify and state the quantity of each type of truck that will be utilized in the Ocotillo area. For instance how many 1500 gallon water trucks will travel through the community each day. How many 5000 gallon water trucks will travel through the community each day and etc. Please list quantities for every specific type of truck so the people of Ocotillo and decision makers will have an accurate and clear vision of what to expect. It would also be helpful to know the work hours for all trucks, including start and stop times. and that does include water trucks.
The recent approved Sunrise Power Link Project has allowed long water tanker style trucks to run 24 hours per day. Here in Ocotillo, when we can hear the sound of a crows wings flying in the air, the construction traffic noise will be of a great concern. P174-01

Very Sincerely: Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Thursday, August 25, 2011 11:01 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

My name is: Parke Ewing (Ewingduo@aol.com)
Po Box 84, 98 Imperial Hwy.
Ocotillo, Ca, 92259

Mr. Perry:

My house located at 98 Imperial Hwy. (at the "m" Imperial Hwy, on figure 2.3-2, will be surrounded by wind generators at an estimated 220 degrees encircling my house. That leaves me a view of only 140 degrees of nothing but houses that I can't see anyway because my house faces North. My view is to the North. I recommend no wind turbines East of the Sunrise Power Line, but we are opposed to the entire project.

P175-01

Has anyone considered an alternative and utilizing vertical wind turbines. Wind generator technology is rapidly changing, if these monsters are allowed to be built, the very latest technology should be required. A fast track to get a poor project will make this project outdated very early. Waiting and slowing this project back a little could insure that the newest technology is used and the project could have a better chance of long term survival.

Very sincerely: Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Friday, August 26, 2011 6:45 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Fwd: FW: If you see one of these starting to smoke...RUN!

My name is: Parke Ewing (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

I saw no mention of WTG transmission problems in your EIR/EIS draft report. The enclosed pictures support that there is a problem. Evidently this is a known problem since federal grant money has been allocated to find solutions.

I am very concerned that myself and residents of Ocotillo could be exposed to these hazardous conditions.

P176-01

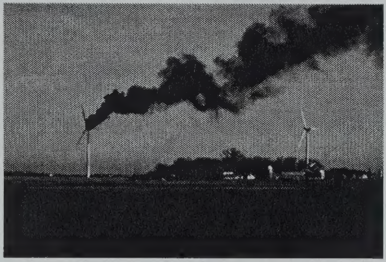
Very sincerely:
Parke Ewing

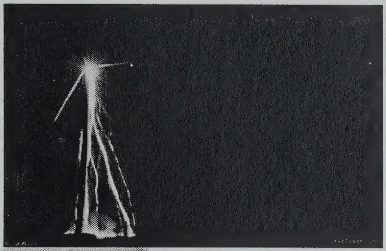
Gear oil too hot.

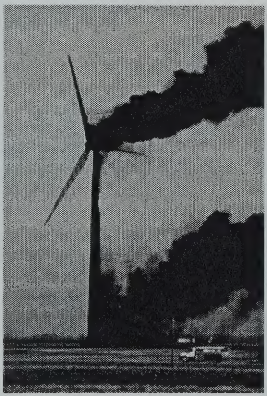
If you see one of these starting to smoke...RUN!

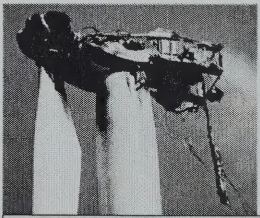
Gear oil failures in windmills

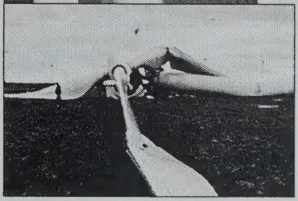
Here are some photos of what happens when transmission failures occur in windmills. To date no gear oil has been invented to withstand the pressures produced within these transmissions. Most recently, the government gave Dow-Corning a big grant to work on it. Previously, many others had tried and failed

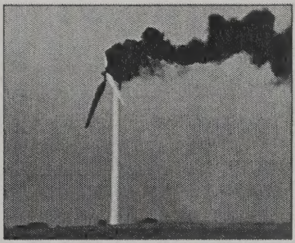


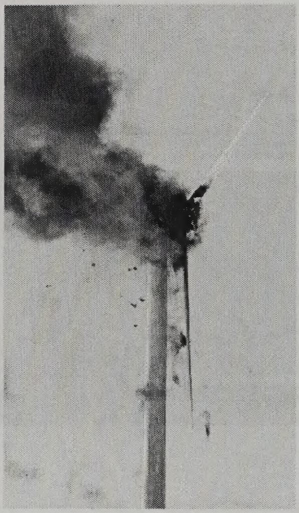


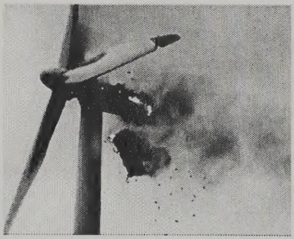


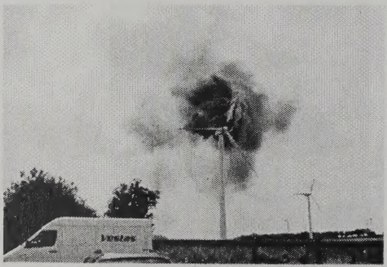








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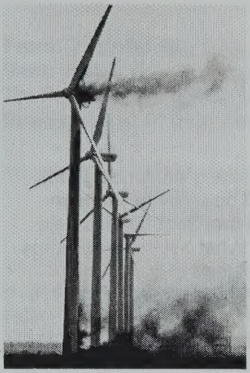
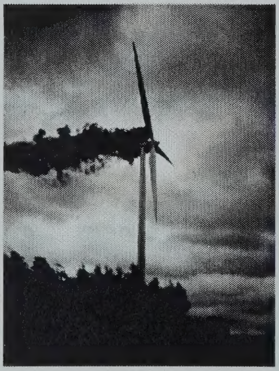


Boy, they really burn good, don't they?



From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Friday, August 26, 2011 6:52 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Express Project

Concerning the Ocotillo Wind Energy Project, I would like to know the amount of the grant funding that Pattern Energy is to receive. I would also like to know the lease amount that will be paid from Pattern Energy to the BLM for the use of federal land here in Ocotillo. I also have heard that the BLM has paid Pattern Energy progressive payments for their preliminary work on this project. What will those amounts total? **P177-01**

Thank you:
Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Friday, August 26, 2011 8:21 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

My name is: Parke Ewing (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

The draft EIR/EIS does not adequately address possible public health issues associated with WTG's located in and near residents. There have been no scientific studies that prove health issues do not exist. We only hear from WTG companies that there are no health issues. This project should not be constructed until proper health issue studies have been proven. **P178-01**

Thank you:

Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Friday, August 26, 2011 8:24 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

My name is: Parke Ewing (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

The draft EIR/EIS report did not list Wind Turbine Generator Anticipation Syndrome. Please include proper comments in your final report. **P179-01**

Thank you:
Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Friday, August 26, 2011 8:42 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

My name is: Parke Ewing (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Re: the Ocotillo Wind Energy Project draft EIR/EIS report. The Visual Resource Analysis, figures 4.18-2A, 2B, 3A, 3B, 4A, 4B, 5A, 5B, 6A, 6B,7A, 7B, 7C, 8A, 8B, 9A, and 9B do not adequately represent a true visual impact of the proposed project, due to the fact that no scale was provided or shown on the computer generated drawings. It appears that the WTG's shown on the visual impact drawing are much smaller than the actual size described by the Pattern Energy submittals and details of their proposed structures. The proposed total height of the WTG's is 448'. That height is equal to a 44 story building, each! **P180-01**

Thank you:
Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Friday, August 26, 2011 9:13 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

My name is: Parke Ewing (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Re: Ocotillo Wind Energy Project, the Visual Contrast Rating Data Sheets, evidently prepared by Michael Clayton, states that the degree of texture for the new structures will only have a moderate change from the existing landscape. The texture of the existing vegetation compared to the proposed new WTG texture will be quite evident that they are "not" as the same or similar in texture. Therefore the degree of contrast should be changed to a strong (4) in all categories listed. **P181-01**

Thank you:
Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Friday, August 26, 2011 9:30 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Re: Ocotillo Wind Energy Project and the Fugitive Dust Emission Calculations Assumptions, the silt content is assumed to be 12% on average per the hand book for Mountain Roads, stated in the EIR/EIS draft report. Is there a hand book for desert roads that would more accurately assume "desert conditions" and silt content?

P182-01

Thank you:
Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Friday, August 26, 2011 9:43 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

My name is: Parke Ewing (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Re: Ocotillo Wind Energy Project and the Visual Resource Analysis, the key observation points shown on your figures 4.18-2A through 4.18-8B do not adequately show how the changing views will appear from other observation points, such as my front porch looking North. Since my house is one of the most highly impacted, I request that my house be used also for an Observation Point that will more adequately show the impact of this project. **P183-01**

Thank you:
Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Friday, August 26, 2011 10:38 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

My name is: Parke Ewing
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

RE: 4.12.6 of the draft EIR/EIS report. The only alternative that I will be happy with is "**ALTERNATIVE 5**" No Issuance of a ROW Grant and No LUP Amendment (No Action)

Please note that 99% of the residence of Ocotillo oppose this project. Any alternative that allows the construction of WTG's should also include a revenue implementation program for the residence of Ocotillo, since the people of Ocotillo well obtain zero benefits from these type of projects.

P184-01

Thank you:
Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Saturday, August 27, 2011 8:37 AM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

My Name is: Parke Ewing (Ewingduo@aol.com
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

I am enclosing articles and information that have been written to protest the installation of Wind Turbine Generators located close to residential communities. Our government is not listening to us. These articles need to be included with other protest articles.

P185-01

d: August 27, 2011 • New York

Residents meet about wind-project concerns

[Alternate short URL for linking/sharing • HOME]
» *Translation tools are available at the bottom of the page* «

Credit: By Kate Day Sager, Olean Times Herald, www.oleantimesherald.com 26 August 2011

CARROLLTON — Olean Mayor Linda Witte said she believes Allegany Town Supervisor Patrick Eaton has "sold his soul" for the proposed wind turbine project that has caused turmoil in his community.

Mayor Witte's comments were made during a meeting held Thursday at the American Legion in the town of Carrollton. The session was organized by Nichols Run resident Mike Lippert and attended by more than 60 area residents. Those at the gathering discussed concerns with the safety of the proposed Church Street/Nichols Run area through Limestone for trucks carrying materials to a proposed wind farm site in the town of Allegany. A number of residents from the town of Allegany who are against the wind farm project were also in attendance.

"It's like a three-ring circus, you don't know who the head monkey is," Mayor Witte said of the Allegany Town Board and Mr. Eaton. "I'm sorry, but I think Pat … kind of sold his soul" for the project.

At issue is a 29-wind turbine farm, with each standing over 500 feet high, to be constructed by EverPower Wind Holdings Inc. in the Knapp Creek and Chipmonk areas. A special meeting has been scheduled by the Allegany Town Board for 7 p.m. Monday at the Allegany Senior Center on Birch Run Road to vote on a wind overlay district for the proposed wind farm. If the board votes "yes" on the proposal, the wind farm project will be approved for construction. The proposed project has caused upset in the community for the past several years for area residents who oppose the wind farm. Two rallies, consisting of large numbers of people against the project, were held in Allegany in the past week.

While no elected officials from the towns of Carrollton or Allegany attended Thursday's meeting, Mayor Witte's presence encouraged many in attendance. Mayor Witte had questioned EverPower's earlier plans to transport 8,500 truckloads of wind turbine materials through Olean, saying the damage could be as high as $39.5 million to city streets.

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filed: August 27, 2011 • Ohio

Blade gets splintered during ferocious storm

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» Translation tools are available at the bottom of the page «

Credit: By MARK TODD, Star Beacon, starbeacon.com 26 August 2011

CONNEAUT — Lightning damaged one of the blades on the gigantic wind turbine on Conneaut's lakefront early Thursday morning, knocking the big generator out of commission, officials said.

Composite material that coats the wooden blades was splintered by the bolt. Pieces of the material were jarred loose and fell to the ground as the blades kept spinning, said City Manager Timothy Eggleston.

"The tip of the blade got blown off," he said. "(The blade) was still turning, and pieces were coming off."

Lightning struck the turbine shortly after midnight, pelting trucks parked below the machine with debris, according to various reports. Wastewater plant personnel successfully shut down the turbine a few hours later, safety personnel said.

An access road to the Pittsburgh and Conneaut Dock Co.'s limestone dock, next to the turbine, was closed to traffic temporarily as a safety precaution.

NexGen Energy of Boulder, Colo., owner of the turbine, has been contacted, Eggleston said. It's believed the blade will have to be replaced, officials said.

The turbine generates about 20 percent of the power used by the sewage treatment plant, officials have said. The loss of the electricity it provides will not affect the plant's operation, Eggleston said.

"Everything's fine," he said.

The 400-kilowatt turbine is the second of two erected by NexGen, which became operational in early 2010. The first, a larger 600-kilowatt machine, sits at Conneaut Middle School but has worked only sporadically because of hydraulic problems.

The lightning strike occurred during a violent storm that lashed parts of the county with heavy rain. Nearly 3 inches of rain fell within a three-hour span Thursday morning at a weather station monitored by Ron Coursen, National Weather Service observer. The downpour overwhelmed drainage systems, flooding some roads and intersections, officials said.

Some 8.6 inches of rain has fallen in August, Coursen said. "That's a lot of water," he said.

As of mid-afternoon Thursday, dozens of county residents were without power thanks to the storm. Outages were reported in Ashtabula, Conneaut, Geneva, Jefferson, Roaming Shores, Rock Creek, Unionville and Austinburg Township.

Ashtabula Public Works employees labored for eight hours Thursday to clean up the branches and large limbs of an uprooted tree on Foster Avenue. Employee Henry Henton wore heavy gloves as he tossed the smaller branches into a pile, the overturned tree ripped from the ground on the hillside above him.

"While this tree isn't on city property and though the city does not own the tree, it is our responsibility to clear the branches and limbs and debris from the road and the sidewalk, for safety," Henton said.

The road remained closed Thursday night, and Henton said he believes wind doomed the large tree, which was rooted at the crest of the small embankment.

"With no ground to root into on the one side, the wind just took hold of it and pushed it right over," he said.

Thursday morning brought some flooding to the Geneva area, as two motorists became stranded in standing floodwater.

A woman dialed 911 on Thursday morning when she became stuck in her car on Depot Street, her vehicle disabled by the floodwater, Geneva dispatch records show.

A man was stuck similarly in floodwater on Route 20, near the Northridge Yamaha Suzuki dealership, but was able to get his vehicle moving by himself, Geneva dispatch records show.

No one was injured, dispatch records show.

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filed: August 26, 2011 • Maine

Protest opposes Maine wind projects

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Credit: By Erin Rhoda, Staff Writer, Morning Sentinel, www.onlinesentinel.com 26 August 2011

NORRIDGEWOCK — Willow Cordes-Eklund, 27, had one thing to do before reporting to jail on Thursday: join a protest against Maine industrial wind development projects.

The Minneapolis, Minn., native, who was arrested for blocking a tractor-trailer truck hauling a wind-turbine blade in Chain of Ponds Township last summer, brought a large cloth sign that read, "Silly turbines, wind is for eagles."

About two dozen people from at least eight counties gathered for the demonstration at the intersection of U.S. Route 2 and Route 139.

The protesters stood on the sidewalk along the route traveled by trucks carrying massive turbine parts to the Record Hill Wind LLC project in the small Oxford County town of Roxbury.

The turbines on Thursday were delivered according to schedule before the protest began, according to state police, but one activist said the event was about educating people.

"It's all about education and awareness," Concord Township resident David Corrigan said. "I haven't yet met an honest person who supports industrial wind once they know all the facts."

Thursday was selected for the protest because it's the day Cordes-Eklund, a member of the Earth First! movement, had to report to Franklin County Jail to start serving a 10-day sentence for failure to disperse.

In July 2010, she used a bicycle lock to chain herself by the neck to a tractor-trailer during a protest of the Kibby Mountain wind power project in Franklin County and was arrested after police had to cut the lock.

"I came today to show my support in the continued fight against the destruction of mountains in Maine," Cordes-Eklund said, a tattoo of a crow on her forearm.

"I don't live a life of regret," she said. But she added, "I do wish we didn't have to go through these extreme measures to have our voices heard."

The $135 million Record Hill wind project will have 22 turbines and an eight-mile-long transmission line, which will connect with Central Maine Power Co.

The turbines, each worth more than $3 million, are built in Denmark by Siemens and shipped overseas to Searsport, said Rob Gardiner, one of the principals of Independence Wind LLC. Former Gov. Angus King is also a principal.

Yale University Endowment is a major sponsor of the project, working with Independence Wind, of Brunswick, and Wagner Wind Energy I LLC, of Lyme, N.H.

It's anticipated the turbines will be producing electricity for the equivalent of 20,000 typical Maine households by the end of fall.

"As long as they're not getting in the way, expressing their opinion is pretty routine," Gardiner said about people protesting. "This has happened on every wind project in Maine. It's an opportunity to make a statement."

He said the electricity will flow into the Central Maine Power grid, so the project will benefit Maine residents.

Though surplus Maine electricity spills into the New England power grid, for every hour a wind project generates electricity, "it is reducing electricity costs to the customer because it means a more expensive gas-generated plant is not running as heavily," Gardiner said.

"The cost to the customer is less. Every customer benefits," he added.

People at the protest largely supported wind energy in general but opposed the turbines' environmental impact on remote areas of Maine. Several wind power projects are proposed for areas of Somerset County.

"They just don't belong on the mountaintops," said one activist, 72-year-old Dick Roberts, of Dixfield. Wearing a green felt hat with a feather in it, he said he has enjoyed hiking portions of the Appalachian Trail throughout his life.

He worries about the effect of turbines on animals, how the whirring of blades might disturb residents and the impact construction has on nearby water systems, he said.

"There's nothing green about clear-cutting mountaintops and ridges for whatever purpose," added a man who identified himself as Storm Waters, of Augusta.

The subsidized projects will undermine tourism, said Lexington Township resident Jonathan Carter, director of the Forest Ecology Network. The projects won't noticeably reduce carbon dioxide and they won't create many jobs, he added.

Monique Aniel, of Oquossoc, is co-chairman of the Citizens' Task Force on Wind Power. A retired physician, she has seen the effect turbines have on people's health, particularly on the island of Vinalhaven, she said.

Though she does not live next to a wind development project, she said she became involved out of "empathy toward people who are suffering with undue stress," she said.

If people are not allowed to erect billboards in Maine, she asked, why are 25-story turbines allowed in Maine's wild areas?

"You sacrifice a whole area," she said.

In the case of the Roxbury wind project, nearby Rumford has a natural gas-fired power generation facility with an electricity output capacity larger than that of the wind-turbine project, she said.

It doesn't make sense to "destroy an entire vista of mountains with 400-foot turbines lit at night," she said, when the gas plant, Rumford Power Associates Limited Partnership, is a short distance away, does not always operate at capacity, and is processing a relatively non-polluting product.

Though the event was not organized by one group, the people present represented at least eight different organizations. In addition to the task force group, there were people from Friends of Lincoln Lakes, Friends of Boundary Mountains, Maine Earth First!, Concerned Citizens to Save Roxbury, Friends of Highland Mountains, Friends of Maine's Mountains and the River Valley Alliance Against Wind.

The communities they came from included Belgrade, Augusta, Concord and Lexington townships, Rumford, Freeport, Dixfield, Lincoln, Corinth, Oquossoc, Verona Island and Sangerville.

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filed: August 26, 2011 • Oregon

Court won't enforce turbine noise rules

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Credit: By ERIN MILLS, East Oregonian, www.eastoregonian.com 25 August 2011

The Morrow County Court stunned a crowd Wednesday when it refused to enforce an Oregon law that limits the noise a wind project can make at nearby homes.

The court voted 2-1 that, although noise from the Willow Creek wind project exceeds state standards at a few homes, the violations did not warrant enforcement action.

At one home, for example, the noise level exceeded limits 10 percent of the time the turbines were running, according to the project's own acoustical expert.

County Judge Terry Tallman voted against the motion, only because he was against the vote itself.

"We don't have the funds to force compliance," he said. "The state of Oregon says it doesn't have to do it, because it doesn't have the funds. Why are we being forced to live by a higher standard than the state of Oregon?"

Tallman was referring to the Oregon Department of Environmental Quality, which wrote and, for a time, enforced the state's industrial noise control regulations. The laws still are on the books, but the DEQ terminated its noise control program in 1991 because of budget cuts. That left enforcement up to local agencies.

Morrow County adopted the state's noise control rules and asks wind projects to comply as part of the site certification process.

Wind projects less than 105 megawatts may seek a conditional use permit from the county; larger projects must go through the Oregon Energy Facility Siting Council.

Morrow County granted the 48-turbine Willow Creek project, north of Ione, a permit in 2005.

However, after neighbors of the project began to complain about noise, county officials began to realize Oregon's noise law is not exactly crystal clear. And a parade of lawyers and acoustical experts, for the neighbors and Invenergy, the Chicago-based company that developed the Willow Creek project, further muddied the waters.

The law says a wind project may not increase noise at adjacent homes by more than 10 decibels. If a wind developer does not conduct a study to determine the ambient noise at a site, it may use an assumed background of 26 decibels, for a total of 36 decibels.

Willow Creek's neighbors believe a wind developer must choose, before it builds, whether to conduct an ambient noise study or go with the assumed level of 26 decibels. If it goes with 26 decibels, it cannot break the 36-decibel limit by even one decibel.

Invenergy claims there is no "bright line" noise standard, that it can generate 36 decibels at nearby homes or 10 decibels above the ambient, whichever is higher, up to 50 decibels.

At a planning commission meeting last year, Invenergy's acoustical expert, Michael Theriault of Portland, Maine, admitted the project violates the standard even by its own, looser definition.

But because the violations are so minimal, by only a few decibels a small percentage of the time, he said, they qualify as "infrequent and unusual events" and therefore exempt from the law.

An acoustical expert for the project's neighbors came to different conclusions.

Kerrie Standlee, who has helped complete site certificates for the Oregon Department of Energy, said the wind farm consistently broke the noise rule at precisely the time when Theriault decided not to use the study data, when wind speeds exceeded 9 meters per second.

Standlee said the wind project broke the noise rule by more decibels, and more frequently, than Invenergy claimed.

In its decision Wednesday, as in previous deliberations, however, the Morrow County Court disregarded Standlee's testimony and relied on Invenergy's conclusions.

"There might be some violations," Commissioner Ken Grieb said, "but we don't think they're significant enough to take action."

The ruling is a reversal of a previous, January decision, in which the court agreed the project violates the wind rule at Dan Williams' house. His home is the one at which the violation appears to occur most frequently.

That decision modified a Morrow County Planning Commission decision, which found Invenergy out of compliance at four nearby homes.

All parties appealed the county court's decision to the Oregon Land Use Board of Appeals. The board returned the decision to the county, asking the court to clarify its decision.

"I'm flabbergasted," said Jim McCandlish, a lawyer for three of the neighbors, after the vote. He said his clients' constitutional right to due process was being denied. He said they intend to appeal the decision to the board of appeals.

"The county court has an obligation to protect the health and welfare of its citizens," he said.

Irene Gilbert, an anti-wind activist from Union County, called the vote ridiculous.

"I think it sets a really bad precedent when a group of county commissioners say, in spite of the data that says there is a violation, we are choosing not to act on it."

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filed: August 26, 2011 • Vermont

Wind power protesters tackle Montpelier

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Credit: By Christopher Roy, The Newport Daily Express, www.newportvermontdailyexpress.com 25 August 2011

MONTPELIER – More than 100 wind tower opponents, particularly those opposed to the one Green Mountain Power has planned for a ridgeline in Lowell, gathered at the State House yesterday morning. The protesters strongly voiced their opposition to the project and Bread and Puppet Theater of Glover put on a skit supporting the protesters.

After delivering a lengthy letter to Gov. Peter Shumlin's office and comment cards to the Department of Public Service, the opponents boarded buses that took them to the Green Mountain Power office in Colchester where they delivered a second letter.

Luke Snelling, the director of communications for Energize Vermont, told the press that the opponents wanted to tell state and company officials that they should do more solar power and no large wind power.

"Large scale utility wind has large scale impacts on our natural resources and our communities," he said. "We believe solar is a better solution for the State of Vermont."

Solar is getting more affordable and smaller, Snelling said.

Dr. Ron Holland of Irasburg called the wind project "a total corporate scam" that will benefit foreign corporations that put up the money for it.

"We pay higher rates and they destroy our mountains," he said. "There is no benefit for Vermont."

The opponents, in between speeches in both Montpelier and Colchester, chanted "Solar not Wind" and "Shumlin, Do You Hear Us Now?" However, the governor was reportedly out of state and therefore not able to see or hear the demonstrators.

Prior to the demonstration, Nancy Warner, president of the Lowell Mountains Group, said the opponents wanted to tell Gov. Peter Shumlin and GMP officials that project will be devastating to the area. She said the project would be the largest in the state. Warner is also concerned about the blasting that will take place.

Warner is more concerned about how the project will affect the mountains, water and wildlife that have been in the area for thousands of years than she is about the visual impact. She is also concerned about corporate greed and is worried the price of power will increase dramatically.

"As of today, and every day in the future, that we stand here and throughout this state, we are now setting the energy agenda," said Snelling to the cheering crowd. "We believe there is an energy future in this state that is independent, that is homegrown and that is as unique as this state. We can have the character of Vermont that love and we can also have the renewable energy that we need."

Snelling vowed that opponents would continue to send their message.

"We know there are people who don't want this project," said GMP spokesperson Dorothy Schnure. "We also know the vast majority of Vermonters do want wind."

The Public Service Board and the Agency of Natural Resources have extensively reviewed the project, said Schnure. She said both solar and wind projects are necessary in the state.

"Anyway you generate electricity has environmental impacts," she said. "Solar uses a lot of land."

Vermont Electric Cooperative officials have agreed buy power from GMP at cost, Schnure said.

The Lowell wind project should be complete by the end of 2012.

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Comment Letter P186

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Saturday, August 27, 2011 12:18 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

From: Parke Ewing
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Re: Ocotillo Wind Energy Project

Pattern Energy and the BLM is quick to report that this proposed project will only have a footprint of 196 acres of the 13000 acres that encompasses the project. Please note that if the square feet of "vertical visual footprint" is calculated, each wind turbine generator will displace 2.41 acres of visual space. If 155 WTG's are approved the visual vertical footprint will be 373.55 acres, also please note that the area of visibility is only calculated to a height of 448', therefore the actual visual disturbance is spread out horizontally for approximately 5-6 miles or a 220 degree view from my home. The WTG's may be placed 1300' apart, but when the rows of multiple WTG's are laid out the view is blocked by over 75%. To actually state that the footprint of the project is 196 acres is like me installing a 448' high fence around my property, but the footprint is only 118 square feet, but the visual vertical impact would be 1,702,400 square feet, that almost 1.75 million square feet. The relationship to one another is not related.

P186-01

Thank you:
Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Saturday, August 27, 2011 1:22 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

From: Parke Ewing
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca.-92260

The fast track pace of this project is overwhelming to the residence of Ocotillo and many other communities throughout the USA and other countries. I propose a moratorium on this project until further studies for the need, visual impacts, and health hazards are adequately studied with unbiased and non-subjective opinions. Most people do agree with the benefits of renewable energy, but ruining people's lives that will live next to these monsters is not right. The Imperial Valley Planning and Land Development Dept. is required to assure that all home owners live in an environmentally safe atmosphere. Just simply say "NO" to this project. The wind industry is also making giant steps forward with new technology, please don't fall for a technology that will be displaced in a short period of time and will have resulted in destroying lives, views and desert landscape. **P187-01**

Thank you:
Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Saturday, August 27, 2011 1:46 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project.

From: Parke Ewing
PO Box 84. 98 Imperial Hwy.
Ocotillo, Ca. 92259

I thing the public scoping period and gathering of public comments is just a period of time that allows us here in Ocotillo to have false hopes of stopping this massive project. I think Washington DC and Sacramento has demanded that government agencies and the dreaded bureaucracy approve these type of projects no matter where they are located. Especially here in Ocotillo where they know we can't adequately fight these projects. These projects are getting built before a mandatory requirement to reduce energy costs is implemented. As usual, the bureaucracy is putting the cart before the horse. Please save our public lands, this project is not necessary. Please step up to the plate and voice your personal fears of this project. Be the first government employee's to just say no! **P188-01**

Thank you:
Parke Ewing

Comment Letter P189

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 10:48 AM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Re: The proposed Ocotillo Wind Energy Project and the Possible unknown effects of Electromagnetic Magnetic Fields

Per the draft EIR/EIS, it states that EMF's are uncertain and may need to be considered prior to human exposure. No state or federal "safe zones" have been determined. This project combined with the Sunrise Power link Transmission Line and the older existing transmission line, plus possible future power transmission lines and their accumulative effect on humans has not been adequately determined. It should be the largest concern and a priority of our government agencies to safely protect the public and especially to protect people forced to live close to these projects. How can our government assure that EMF will not harm us in anyway when sufficient studies have not been performed? Who will be responsible for possible health issues, Pattern Energy, SDG&E, Sempra Energy, BLM, Imperial Planning Dept.? Who will be responsible after these companies change their names or sell their projects when EMF's are determined to be a health issue? **P189-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 12:04 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Re: The proposed Ocotillo Wind Energy Project

Urban Green Energy Inc. has developed a 6' tall windmill. I would lean toward this low profile technology that would be less of a visual impact from my home. This new technology should be considered as an additional alternative. **P190-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P191

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 12:28 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Facility

Re: the proposed Ocotillo Wind Energy Project.

On section 3.2.1.1 Meteorological Conditions, Pattern Energy states that a median wind speed, from the Southwest and West, for this area is 10.7 mph at a meter height of 10 meters. They also state that the winds from these directions only occur half of the time. Does that translate into saying the wind only blows at that speed for half the time or does they wind on come from those directions half the time? If the wind speed only occurs half the time, does that mean that the 465 MV capacity of the wind turbines is cut in half to only 232.5 MV? If that statement is true, how does Pattern Energy plan on producing the 318 MV to SGG&E per their power agreement? Please explain in your EIR/EIS reports that load followers will be required to make up the difference and they could come from a gas fired power plant. The environmental effects at the locations of the load follower producing plants should be determined and stated. **P191-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at:
caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 12:38 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Re: Ocotillo Wind Energy Project and scoping period

I am realizing that the length of time allocated for scoping comments did not give me or others adequate time to research this proposed project and enable us to comment with some degree of competency and knowledge.
I insist that the comment period be extended. I'm getting the feeling that our new researched comments will be passed over and simply placed in to the final EIR/EIS. The people deserve better than this! **P192-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P193

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 12:49 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Re: The proposed Ocotillo Wind Energy Project
Since Pattern Energy plans on obtaining and hauling water from a private water well near Pine Valley, the draft EIR/EIS report should also contain information as to the effects of a decreased water table and the significant effect of trucks to the environment in the Pine Valley area and also the effects to traffic on Interstate I-8. Will Pattern Energy be responsible for wear and tear to all public roadways?

P193-01

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: *Ocotillo Wind Energy Project*

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P194

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 12:57 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

P194-01

Re: The proposed Ocotillo Wind Energy Project
The draft EIR/EIS report states that camping can resume in the effected area once construction is complete. Does any actually think anyone would want to camp amongst the windmills when they are completed. Camping in this area will halt and what a shame that will be for the public. Also the report stated that shooting is allowed in this area, will that really be allowed when this project is complete? I see fencing in the future, even though the statements from Pattern Energy state otherwise. This project is simply bad for this area.

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at:
caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P195

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 1:33 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocortillo Wind Energy Project

Re: The proposed Ocotillo Wind Energy Project and Recreation 3.15, the project will have a significant impact on the area, because people that camp won't want to camp next to Wind Turbine Generators. The box "Potential Significant Impact" should be marked with an X, in lieu of the box marked "Less Than Significant Impact." There will not be a detectable increase in the use of parks simply because this project will run people off. Most of the general public is not aware of this project. The need for scoping comments should have been extended to the general public with an information campaign in other cities. I saw no information on TV or radio. Many people that I have spoken with were not aware of this hideous project during the scoping period. **P195-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

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PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 1:42 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Re: The proposed Ocotillo Wind Energy Project and Noise 3.12
The noise as stated in the draft EIR/EIS report will have a Potentially Significant Impact according to the report. (e) should also be checked as having a Potentially Significant Impact, because this is a private airport and Mr. Emory, the owner doesn't own an airplane. We very seldom see or hear any noise from his private airstrip. So any noise heard in this area would be considered significant. **P196-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

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PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 2:11 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Re: The meeting with BLM, IVPD and the public
Why was it necessary to have 3 armed blm employees at the meeting in Ocotillo on Aug. 25, 2011? There were no armed employees at the previous nights meeting in El Centro! If BLM employees felt that the public could be that upset to require armed guards, maybe this project is simply not right for this area. I'm sure that armed guards were not necessary and they may have given the public a bad feeling toward the understanding capabilities of our bureaucracy. **P197-01**

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PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 2:51 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Re: The proposed Ocotillo Wind Energy Project
If the WTG's are numbered for identification purposes, I am unable to locate them. Can you please inform me of a lay out number for each WTG, for each alternative? Or can you please attach an addendum for the identification of each WTG prior to the October 5, 2011 deadline?

P198-01

I adamantly oppose the construction of the Ocotillo Wind Energy Project

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PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P199

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 2:56 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Re: The proposed Ocotillo Wind Energy Project

I would like to see all comments submitted for this project so I can add my comments if needed. Will the comments be available for viewing on the BLM web site soon? Or, how can I view these comments? **P199-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

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Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P200

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 3:07 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Re: Ocotillo Wind Energy Project
Since this project could be located very near a residential community, the zoning of this project, even though it is on BLM managed land, should follow the current zoning requirements set forth by the local governing agency. The health and welfare/protection of zoning requirements, should be controlled by the agency with the most stringent policies and that appears to be the Imperial Valley Planning Department. To mix and match various regulations as to pick and chose well not benefit the residents or anyone that visits this desert community.

P200-01

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

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PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P201

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 3:46 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Re: The proposed Ocotillo Wind Energy Project

Will the 15 permanent green energy jobs for this project really be worth the money and destruction of the desert? See cost/job ratio of other renewable energy projects listed below:

Sempra Energy's 48-megawatt Copper Mountain Solar plant near Boulder City consumed nearly $55 million in federal and state tax credits and incentives to create five permanent jobs. Enel Green Power got $61.5 million in stimulus funds for its 25-employee Stillwater and Salt Wells geothermal projects in Fallon. And a $490,000 grant to the Clark County Urban Forestry Revitalization Project, which plants trees in economically distressed neighborhoods, created 1.7 permanent jobs.

P201-01

I adamantly oppose the construction of the Ocotillo Wind Energy Project

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PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 4:00 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocorillo Wind Energy Project

Now why are we proposing to build this project? See Gov. Browns comment below: **P202-01**

California Says No to Renewable Energy Imports

August 28, 2011 - At a public meeting of the Nevada Public Utilities Commission in Las Vegas on August 24, this letter was distributed. The ramifications could be great for states like Nevada who seek to build large numbers of renewable energy projects and long transmission lines in an attempt to export power to California. The Governor's office of California says: "No thank you, we have enough renewable energy in state."

OFFICE OF THE GOVERNOR

August 3, 2011

Mr. Brad Nickell
Director, Transmission Expansion Planning
Western Electricity Coordinating Council
155 North 400 West, Suite 200
Salt Lake City, Utah 84103

Re: Reflecting current California trends and policies in regional transmission planning

Dear Mr. Nickell:

In the time since the Western Electricity Coordinating Council (WECC) embarked on its process of preparing the western interconnection Regional Transmission Plan, much has occurred in California. Significant reductions in the technology cost of solar generation and the availability of investment tax credits have resulted in large scale resource development within the borders of our state. We also have a new Administration that has put into place strong policies supporting additional in-state and distributed local generation. Taken together these recent trends significantly affect the outlook for California as an import market for power in the western United States.

In 2010 alone, the State of California approved eleven large solar and wind projects together totaling over 5,000 megawatts (MW) of renewable generation capacity.[1] In 2011, the state has already permitted an additional 1,000 MW of solar PV projects; we anticipate that by the end of the year we will have permitted another 5,000 MW of solar and wind, bringing the total amount of large-scale renewable energy projects permitted in the state in only two years to approximately 10,000 MW. This surge in permitting moves California closer to bringing online the additional 15,000 to 20,000 MW of renewable generation capacity needed to meet our goal of generating one-third of our power from renewable energy resources by 2020.

The pipeline of projects seeking future approval is robust. The California Energy Commission has recently found 513 projects seeking permits to construct and operate in the State of California representing over 49,775 MW of nameplate renewable generation capacity. This is in addition to the 5,300 MW of large-scale (200 MW plus) projects

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[1] Of these 5,000 MW, approximately 3,500 of them were a direct result of the historic collaboration between California and the U.S. Department of the Interior.

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: *caocotillo@blm.gov*

The subject line should be: *Ocotillo Wind Energy Project*

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PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 4:30 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Please take the time to look at this video! We don't want our community to look like this. **P203-01**

http://www.youtube.com/watch?v=aU9MHNL9AQk&feature=related

I adamantly oppose the construction of the Ocotillo Wind Energy Project

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The subject line should be: Ocotillo Wind Energy Project

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PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, August 28, 2011 6:05 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: (no subject)

Re: The draft EIR/EIS report 3.10-1

Here in the desert when we can hear a powerful black cow propel himself through the air in the middle of the day, the 35db sound level that Pattern Energy said will be the norm, will be more than most of us out here can handle. We live here for the peace and quite, we don't live in the city for a reason. If WTG's were constructed adjacent to New York City, they probably wouldn't hear them, but here in Ocotillo we will notice a drastic difference in out sound environment. The assumption that 35db is acceptable is erroneous.

P204-01

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: *caocotillo@blm.gov*

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Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Monday, August 29, 2011 7:10 PM
To: BLM_CA_Ocotillo_Express_Wind_Project; Raml, Teresa A
Subject: Ocotillo Wind Energy Project

To Whom it May Concern,

The Bureau of Land Management recently denied the pubic comment opportunities at the El Centro and Ocotillo meetings for the proposed 12,000-acre Ocotillo Wind Express Energy Project on August 24th and 25th, 2011.

Public comments are an important process in the review of large projects like this. Many people would prefer to submit their comments at a meeting rather than in writing. The BLM need only provide a court reporter to record oral comments. When people travel great distances and are not permitted to speak, it appears as though the BLM has already decided to approve this project. This wind project will have negative impacts on native plants and wildlife, prehistoric cultural sites, Native American values, visual resources, private property, property values, and access to public lands. It is the responsibility of the BLM to hear all concerns associated with this project. The BLM can best accomplish this by accepting all comments in both written and oral form.

P205-01

The BLM's National Environmental Policy Act Handbook States: "Public involvement begins early in the NEPA process, with scoping, and continues throughout the preparation of the analysis and the decision." Agencies are required to "make diligent efforts to involve the public in preparing and implementing their NEPA procedures"

(40 CFR 1506.6(a).

I would like to request that the BLM hold another series of public meetings in the local communities in which oral public comments are accepted and recorded. I would also like to request a 30 day extension on the comment deadline for the Draft Environmental Impact Statement. This would allow more time for the public to prepare for additional meetings.

P205-01, cont.

Sincerely,

Parke Ewing
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

I adamantly oppose the construction of the Ocotillo Wind Energy Project

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The subject line should be: Ocotillo Wind Energy Project

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PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P206

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Monday, August 29, 2011 8:38 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Re: The unfairness of the draft EIR/EIS report for The proposed Ocotillo Wind Energy Project

P206-01

It's all fun and games until it's in your backyard. These windmill farm projects should be banned from anyone's backyard. The draft EIR/EIS report failed to have a category on humans that will be displaced by this hideous project. It listed every single wild animal, rodent, bird and plant, but what about humans? Did the NEPA writers intentionally forget about us? Please also provide a list of BLM employees and any person that could be included in the decision making process for this project.
These employees should also attend an open meeting so we can ask direct questions.

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

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PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Monday, August 29, 2011 9:26 PM
To: BLM_CA_Ocotillo_Express_Wind_Project
Subject: Ocotillo Wind Energy Project

Re: The proposed Ocotillo Wind Energy Project

Several alternatives to this hideous project were suggested, such as PV Cells on homes or government buildings, smaller wind turbine generators on the same homes and buildings, a mandatory electricity reduction program, off shore WTG's and the list goes on...Some were briefly discussed in the EIR and some were not.

The limited number of alternatives listed in the draft EIR/EIS report is inconsistent with NEPA guidelines. Sec. 1502.14, States that "all" reasonable alternatives must be considered. Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant. The EIR failed to analyze all alternatives, by simply stating that they were not consistent toward a wind energy project. This assumption is inconsistent with intent of the guidelines for a EIR/EIS report. **P207-01**

1a. Range of Alternatives. What is meant by "range of alternatives" as referred to in Sec. 1505.1(e)?

A. The phrase "range of alternatives" refers to the alternatives discussed in environmental documents. It includes all reasonable alternatives, which must be rigorously explored and objectively evaluated, as well as those other alternatives, which are eliminated from detailed study with a brief discussion of the reasons for eliminating them. Section 1502.14. A decisionmaker must not consider alternatives beyond the range of alternatives discussed in the relevant environmental documents. Moreover, a decisionmaker must, in fact, consider all the alternatives discussed in an EIS. Section 1505.1(e). **P207-02**

1b. How many alternatives have to be discussed when there is an infinite number of possible alternatives?

A. For some proposals there may exist a very large or even an infinite number of possible reasonable alternatives. For example, a proposal to designate wilderness areas within a National Forest could be said to involve an infinite number of alternatives from 0 to 100 percent of the forest. When there are potentially a very large number of alternatives, only a reasonable number of examples, covering the full spectrum of alternatives, must be analyzed and compared in the EIS. An appropriate series of alternatives might include dedicating 0, 10, 30, 50, 70, 90, or 100 percent of the Forest to wilderness. What constitutes a reasonable range of alternatives depends on the nature of the proposal and the facts in each case. **P207-03**

2a. Alternatives Outside the Capability of Applicant or Jurisdiction of Agency. If an EIS is prepared in connection with an application for a permit or other federal approval, must the EIS rigorously analyze and discuss alternatives that are outside the capability of the applicant or can it be limited to reasonable alternatives that can be carried out by the applicant?

P207-04

A. Section 1502.14 requires the EIS to examine all reasonable alternatives to the proposal. In determining the scope of alternatives to be considered, the emphasis is on what is "reasonable" rather than on whether the proponent or applicant likes or is itself capable of carrying out a particular alternative. Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant.

2b. Must the EIS analyze alternatives outside the jurisdiction or capability of the agency or beyond what Congress has authorized? **P207-05**

A. An alternative that is outside the legal jurisdiction of the lead agency must still be analyzed in the EIS if it is reasonable. A potential conflict with local or federal law does not necessarily render an alternative unreasonable, although such conflicts must be considered. Section 1506.2(d). Alternatives that are outside the scope of what Congress has approved or funded must still be evaluated in the EIS if they are reasonable, because the EIS may serve as the basis for modifying the Congressional approval or funding in light of NEPA's goals and policies. Section 1500.1(a).

P207-05, cont.

I adamantly oppose the construction of the Ocotillo Wind Energy Project

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The subject line should be: Ocotillo Wind Energy Project

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PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P208

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, September 04, 2011 4:35 PM
To: BLM_CA_Ocotillo_Express_Wind_Project; angelinahavens@co.imperial.ca.us
Subject: Ocotillo Wind Energy Project

P208-01

Please see attached letter to: Imperial County Health Dept., concerning no safe set-back zones between homes and wind turbine generator projects in the Imperial Valley. Because there have been no studies that have proven a "Safe" set-back.

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: *Ocotillo Wind Energy Project*

Visual landscape ruined - Not needed due to reduction in electricity usage not mandated - Too close to residential community - Electricity rates will increase - The bureaucracy is pushing these monsters without listening to people - The wind turbine generators will be 448' tall, equal to a 44 story building - Better technology for renewable wind energy is expected in the near future. - Your money is being paid to wind energy developers in the form of grant money to enable them to profit - They will be located on your land managed by your BLM - Just to name a few...

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Sept. 3, 2011
To: Imperial Valley County Health Department
Robin Hodgkin, M.P.A., Department Director
Dr. Stephan Munday M.D. , M.P.H., M.S.

From: Parke Ewing (Ocotillo Resident)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259
Ph. 760-358-7221

Re: Proposed "Ocotillo Wind Energy Project"

You may have been advised that a wind turbine generator project is proposed in the town of Ocotillo. Several Wind Turbine Generators (WTG's) could be located within 3/4 of a mile from my residence. I am very concerned of future health issues that could be related to this project. Those concerns are with low frequency noise emissions and Electro Magnetic Fields (EMF). The Imperial County Health Dept. has not adopted safe set-back zones for these types of projects. There are no scientific studies that have proven a safe set- back distance to residential homes. Since Imperial County has not adopted a safe set-back for the Imperial County, because there are none available, I demand that this project not be granted.

As you very well know, it is the responsibility of the health department to assure that residents live in a safe environment. You may consider commenting on this project to the board of supervisors. You may also contact the Bureau of Land Management at: caocotillo@blm.gov or Imperial Valley Planning Dept. at: angelinahavens@co.imperial.ca.gov

Thank you very much for the continued concern for the people of Imperial Valley.

Very Sincerely:

Parke Ewing

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Sunday, September 25, 2011 5:25 PM
To: jhpelley@hughes.net; jeepmeech@yahoo.com; desertharmon@gmail.com; jns5ds@gmail.com; BLM_CA_Ocotillo_Express_Wind_Project; ImaJWalker01@att.net; Linda@tomwatsoninc.net; zoozyq@gmail.com
Subject: Need to fight these wind bastards now...

This guy is right, we need to stand up and fight. We need to get in their face!

P209-01

http://www.aweo.org/Martin.html

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: *caocotillo@blm.gov*

The subject line should be: *Ocotillo Wind Energy Project*

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P210

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Monday, September 26, 2011 10:03 PM
To: BLM_CA_Ocotillo_Express_Wind_Project; angelinahavens@co.imperial.ca.us
Subject: Ocorillo Wind Energy Project

Re: BLM California web site, under wind projects

Your statistics state: 3000 wind turbines produce 234 MW of electricity and generate $600,000 in royalties. That is only 0.078 MW per wind turbine. Pattern Energy states that their Ocotillo Wind Energy Project will generate 465 MW using only 155 wind turbines. That equates to 3.0 MW per wind turbine. It appears that Pattern has overstated their generating capacity compared to the overall wind turbine generation in all of California. I must say that is quite a difference. Also, as the BLM states, 3000 wind turbines generate $600,000 in royalties, that equals 200 bucks apiece. So I would assume that Pattern Energy's 155 turbines at 200 bucks apiece would only generate $31,000. Those figures would hardly justify destroying the desert and peoples lives. Using the BLM figures this project cannot be justified. For that matter, no wind project in California is justified. **P210-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: *caocotillo@blm.gov*

The subject line should be: Ocotillo Wind Energy Project

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Friday, September 30, 2011 5:49 AM
To: BLM_CA_Ocotillo_Express_Wind_Project; angelinahavens@co.imperial.ca.us
Subject: Ocotillo Wind Energy Project

How do we know if the BLM has received all of our very important DEIR/EIS e-mail comments, this time? Many or most of our scoping comments were not received and documented prior to the DEIR/EIS, per Jim Childers of the BLM. Should we also mail you hard copies? I have not received any acknowledgement from anyone at the BLM concerning any of my 55 comments to date. I demand an extension of time to adequately address the acknowledgement of all of our comments. Missing important and informative DEIR/EIS comments could have a dramatic effects on life in this area. **P211-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

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The subject line should be: *Ocotillo Wind Energy Project*

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Saturday, October 01, 2011 7:35 AM
To: BLM_CA_Ocotillo_Express_Wind_Project; angelinahavens@co.imperial.ca.us
Subject: Ocotillo Wind Energy Project

Wyoming to California: Wind power For sale, the following article in Imperial Valley Press 10/01/11

Wyoming officials say a new analysis shows California could save billions in the years ahead by impoting more wind power from gusty high plains.

California has committed to getting a third of its electricity from renewable sources by 2020. Most of that power would originate in California.

A recent study by an agency that helps oversee the western electric grid suggests that California could save money by drawing more renewable power from outside the state.

P212-01

Wyoming officials are calling attention to the Western Electric Coordinating Council study. Loyd Drain with the Wyoming Infrastructure Authority says Wyoming has "primo wind" that could save California utility customers $600 million a year.

A spokesmen for California Gov. Jerry Brown a "robust and vibrant" in-state energy marketplace will drive down California electricity costs.

So, in my opinion the desperate need to fast track the Ocotillo Wind Energy Project is not needed. Simply import power from other states such as Wyoming. Let's do the scientific health research needed now, before people are harmed. Let's not destroy our BLM land, deserts, and wildlife when there are clearly other alternatives to obtain the same goal.

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Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Saturday, October 01, 2011 8:11 AM
To: BLM_CA_Ocotillo_Express_Wind_Project; angelinahavens@co.imperial.ca.us
Subject: Ocotillo Wind Energy Project

The roads around Ocotillo have been destroyed by the construction of the Sunrise Power Link. How can the Imperial Valley and Ocotillo residents be expected to pay for these road repairs when there will be no benefit to the town, A few jobs certainly won't justify the millions of dollars that will be required to repair the roadways. The roadways in all of Imperial Valley will be effected since material and delivery trucks will be utilizing all major thoroughfares. Pattern Energy has not adequately represented the facts or addressed the consequence's of the construction of this major project. **P213-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Saturday, October 01, 2011 12:02 PM
To: BLM_CA_Ocotillo_Express_Wind_Project; angelinahavens@co.imperial.ca.us
Subject: Ocotillo Wind Energy Project

Who will be responsible for decommissioning this proposed project after Pattern Energy sells out to another company? How about when that company sells? Etc, etc? What if any of the companies file bankruptcy? Will a cash bond be in place to enable decommission of the project? Will there be enough money to complete the job after inflation and cost increases? Will our grant money be used for Pattern Energy to purchase the bond? I demand answers to these questions! **P214-01**

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Comment Letter P215

From: EwingDuo@aol.com [mailto:EwingDuo@aol.com]
Sent: Wednesday, October 05, 2011 7:06 PM
To: tim@ivedc.com
Subject: Ocotillo Wind Energy Project

Mr. Kelly (Imperial Valley Economic Development Committee):

I am a resident of Ocotillo. I have attended every meeting concerning the proposed Ocotillo Wind Energy Project. I have not seen you at any of those meetings. Why have you not come to the meetings to introduce yourself? Most of the residents of Ocotillo that will be forced to live next to these massive wind turbine generators (WTG), that you seem to think will be so good for the Imperial Valley, are adamently opposed to this project. We here in Ocotillo have very real concerns over health issues associated with low frequency sound and electromagnetic fields (EMF). A minimum sat-back distance between homes and WTG's has not been safely established no matter what your buddies at Pattern Energy have stated. Scientific studies are now in progress in the UK and have proven that there are health issues caused by living too close to WTG's. Health issues are not the only concerns, devaluation of out property values, our view shed, added dust, wildlife, construction activity, water, and desert land disturbance are just some of the issues that we have. It is very disappointing to see that you have been working so closely with Pattern Energy without once consulting with the very people that will be affected by this hideous project.

Soliciting companies to relocate and to build projects in the Imperial Valley is a worthwhile endeavor, but not all projects and companies are good for the Valley. This project is highly opposed, not only by the people in Ocotillo, but by many people that enjoy this desert community.

Please reconsider your choice to support Pattern Energy and the proposed Ocotillo Wind Energy Project.

P215-01

Very Sincerely:
Parke Ewing

I adamantly oppose the construction of the Ocotillo Wind Energy Project

Please join me in voicing your concerns and comments to the Bureau of Land Management at: caocotillo@blm.gov

The subject line should be: Ocotillo Wind Energy Project

Parke Ewing - Ocotillo Resident (Ewingduo@aol.com)
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259

Ocotillo Wind Energy Project

Final Comments Submitted by:

Parke Ewing
P.O. Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259
(Ocotillo Resident)
Ewingduo@aol.com

October 5, 2011

To: Bureau of Land Management
Cedric Perry - Project Manager
22835 Calle San Juan De Los Lagos
Moreno Valley, Ca. 92553

Mr. Perry:

I have previously e-mailed fifty to sixty comments concerning the DEIR/EIS for this project. During the scoping period I also sent many e-mails that were not posted in the comment section for the DEIR/EIS. I sincerely hope that all of my comments and other people's comments have been read, acknowledged and seriously considered prior to a final EIR/EIS. I highly recommend and demand that a **"no project"** area unsuitable alternative be selected. **P216-01**

This proposed project will create many difficulties for me and other people that will be forced to live less than three quarters of a mile away from this project. I am very concerned about health issues, specifically low frequency sound waves, wind turbine syndrome and electromagnetic fields (EMF). Through my constant research, I have found that most people that are forced to live next to wind turbines have health issues directly related to wind turbines electrical generation. The wind developers and the bureaucracy continue to state that there are no health issues even though no privately funded scientific research has ever been analyzed, until recently. Research in other countries has begun and has proven that there are health issues. I am very concerned that my family and others won't be able to sleep at night. I'm very concerned that my family and others overall heath will deteriorate. I am very concerned that I may die from health issues associated with wind turbine generators. In my opinion, the wind industry is moving too fast and is ignoring health issues that are associated with wind turbine electrical generation, as many people living next to WTG's can confirm. **P216-02**

All but one WTG is proposed to be located in a BLM designated "Limited Use" site. To change this designation for a windmill farm or any project is outrageous. Off roaders have been using existing roads and avoiding critical habitat for years. In fact the BLM rangers have issued tickets to off roaders **P216-03**

P216-03, cont.

for venturing away from the designated roads. To allow a WTG project to be constructed or even considered for this area is absolutely unjustified.

P216-04

Research has indicated that most wildlife will abandon areas taken over by windmill farms. Wildlife will essentially be run off because they simply can't co-exist with wind turbines. This includes the Peninsular Big Horn Sheep. Cows are not wildlife. Pattern Energy has not adequately mentioned this phenomenon.

P216-05

The one wind turbine generator (WTG), that is proposed to be constructed on private property, will require a conditional use permit (CUP) for a zoning change and would also require an increase to the allowable height limitations in a residential area. I am opposed to this change and will argue against the CPU if initiated. In addition, this WTG will also be located closer than three quarters of a mile from my house. Many people are recommending that WTG's not be located any closer than 6 miles from a resident. I agree with that recommendation. Several WTG's will be located within three quarters of a mile or closer to my home. I can't note which ones because they are not numbered on Pattern Energy's layout plan.

P216-06

I have another issue concerning the actual construction. The Sunrise Power Link Construction activity was way over the top as far as noise and bothersome activity. Pickup trucks, water trucks, delivery trucks and concrete trucks were constantly running up and down roads throughout Ocotillo. The crews worked at night with extremely bright lights and the water trucks ran all night long. We heard the rumbling of diesel truck engines all night long. I'm sure this project, with the need for tenfold the water requirements, and enormous quantities of concrete, would generate even more noise at nighttime when the people in this town are trying to sleep. The construction crews will be tripled and quad tripled compared to the Sunrise Power Link construction activity. This little mostly retired community just can't take anymore. Enough is enough. We've had it with construction, to add more construction in this town is not wanted and especially not needed when roof top photo voltaic panels could be added to existing houses and buildings at the point of need. Complaining about speeding trucks, Sunday construction work, dust and trash has been sent to uncaring officials. The whole bureaucracy simply appears to cater to the big construction companies and ignores the people that they were elected to protect and represent. Changing of in place building requirements and zoning to accommodate a wind developer and to allow wind turbines to be constructed on a "Limited Use" designated area would be appalling.

P216-07

Imperial Valley has committed to green energy projects. I have not spoken to anyone here in Ocotillo that is opposed to green energy projects. The Imperial Valley Economic Development Committee headed by Tim Kelley is soliciting green energy projects for the Imperial Valley. We simply insist that the projects be located away from residents and be responsibly constructed in a manner that would not destroy the desert and be consistent with good architectural standards and practices. Set back distances between residents and WTG's should be determined by scientific studies, not studies funded by the WTG developers. Simply locating a wind farm next to a town, just because the area is seen as the best wind, as stated by Pattern Energy, is unacceptable. By the way, the best wind is located approximately 10 miles to the West of Ocotillo. Other criteria that should also be examined where these projects are proposed is the existing wildlife and habitat, view shed, limited use areas, environment, vegetation, and the possible effects of human lives. To simply say, as Pattern Energy has said, that this is the only wind available in the Imperial Valley, so this is where the project must be built, is wrong. People's lives are at stake here. No one has the right to destroy people's lives for any project green, pink or brown. P216-07, cont.

P216-08 Another problem with this proposed project is the deflation of property values. The draft environmental impact statement (DEIS) actually stated that property values in El Centro have increased, while property values in Ocotillo have decreased. I would suspect that this proposed wind turbine project is the reason behind the devaluation of property values in Ocotillo. Who would want to purchase a home next to a windmill farm? In fact, many people all over the world have just walked away from their homes because they could not sell their homes, simply because there were no buyers and they could not live in their homes because of health issues caused by WTG's. Is this the goal of Pattern Energy and the County of Imperial? I, among others, love this desert; we built our homes here, and planned on retiring here. This project would destroy our home values and quality of life. And the funniest thing is; we will not benefit from this project in any way. And further, we don't want any benefits and will not accept any buyouts for this hideously proposed project.

P216-09 As an additional note; I read in the newspaper that Pattern Energy has or has promised to donate money to the Westside School. It is laughable at the timing of these donations, which have been one week prior to BLM meetings concerning the Ocotillo Wind Energy Project. I also hear rumors of sizable donations from Pattern Energy to the Imperial Valley Museum located here in Ocotillo. Is this how Pattern Energy intends to partner with the people of Ocotillo? Come into this small community, destroy the roads, destroy the property values, destroy human lives, destroy wildlife, destroy the views, destroy our quality of life, then donate a little money and make it all okay. I am not accepting this and most honest and caring people would not. Buying votes and trying to influence people's decisions with money is a very unacceptable low behavioral trait, which appears to be typical of greedy companies like Pattern Energy, especially coming from a company that says they will partner with the people of Ocotillo. How would a company partner with a community after destroying it?

P216-10 Pattern Energy doesn't talk much about load followers. In the wind industry load followers are power that will need to be purchased from other sources when WTG's cannot produce enough electricity to satisfy their purchase power agreement (PPA), in this case with SDG&E, since Pattern Energy has a contract with them for 315 MV. The load following power producing plants could be gas fired turbine generators or fossil fuel fired power plants. In fact these other power producing plants must stay online to be prepared to produce the requirements for the electrical grid when WTG's cannot produce electricity. The fossil fuel savings from WTG's projects are extremely exaggerated. It has been proven here in Ocotillo by other meteorological testing devices that the wind here in Ocotillo averages much less than Pattern Energy has stated. Pattern Energy states that the proposed Ocotillo Wind Energy Project can produce 465MV of electricity. That statement is very misleading simply because the wind only averages about a third less than the peak requirements for optimum wind turbine production. For anyone with decision capabilities for this project please beware that Pattern Energy personnel are experts at deceiving public officials and attempting to sway the public.

Tomorrow, October 6, 2011, the last day for public comments to the DEIR/EIS, Pattern Energy will advertise the following with a handout at an Imperial Valley Economic Development Meeting and will request that the public contact the BLM and county to support the following:

1) *Create local business activity and jobs*
2) *Produce clean energy*
3) *Generate millions annually in taxes for the county, schools and state*
4) *Support community initiatives through a community benefits program*

My answers to the above:

1) *Will create local business activity and jobs in El Centro by destroying the lives of residents in Ocotillo. And the activity will only be for a relatively short period of time during construction activity. Another very misleading statement by Pattern Energy.*
2) *Produce clean energy, the turbines are filled with 80 gallons of lubricating oil and the load followers required to supply back up power when the wind turbines cannot meet their 315 MV Purchase Power Agreement (PPA) with SDG&E. The construction equipment, delivery trucks and water trucks will use hundreds of thousands of gallons of diesel fuel. That hardly is producing clean energy. Another misleading statement by Pattern Energy.*
3) *It is not clear to the public how these taxes will be determined. Officials will not release this information. But, Pattern Energy will receive millions of dollars in grant money if this project is approved. So let me get this straight, Pattern Energy will pay taxes, tax payers will pay taxes, then Pattern Energy get their tax money back in the form of grant money! That sounds like a wash to me. Another misleading statement by Pattern Energy.*
4) *Support community initiatives through a community benefits program? What community initiatives? Benefits program? Sounds like pay off or buy out to me. Another way Pattern Energy partners with the community I suppose? Another misleading sells technique and a statement that means nothing...*

P216-11

The Ocotillo area is a prime area for family camping and nighttime viewing of the stars. The proposed project abuts the well known Anza Borrego State Park, a desert conservation area. The site of the proposed Ocotillo Wind Energy Project is constantly patrolled by Border Patrol personnel in vehicles and aircraft, in the search for illegal immigrant activity. Military helicopters practice take off and landings at the Emory Airport. Military aircraft are constantly flying over this area. There are concerns that WTG's impede radar capabilities. If there is a slight chance of radar interference, my home and visitors could be in jeopardy of crash landings.

P216-12

Pattern Energy has stated that warning lights located on the top of the WTG's will sense approaching aircraft. Warning lights will remain unlit until aircraft is sensed approaching the site, then the warning lights will be switched on to warn aircraft of the eminent danger of 448' tall WTG's. Due to the abundant frequency of military, border patrol and private aircraft, it would seem to me that the warning lights would simply blink most of the time due to the quantity of aircraft in this area. This whole idea is more of a wishful selling point than an actual working solution.

P216-13

Erosion is another major problem in this area. I've seen this area after disastrous flooding from Myer's Creek. This so called creek can be a rushing river when it floods. I don't think anyone including the Army Corps of engineers has any idea how destructive these floods can be.

P216-14

Underground electrical conduits, roads, substations and tower foundations could easily be destroyed or damaged from these floods. I've seen it and will never forget it. Pattern Energy does not specifically address the consequences of major flooding to underground electrical conduit, substation infrastructure concrete equipment support piers and or roadways in the DEIR/EIS. **P216-14, cont.**

Please don't forget that Pattern Energy plans to construct 42 miles of roads in this "Limited Use" area. And that must also mean that at least 42 miles of underground electrical conduit must be installed. That's **42** miles. Unbelievable destruction! Just a reminder, electrical conduit is manufactured from oil... So the actual saving of oil is diminishing rapidly and the green house gases not generated with the wind turbines will actually be generated by other means. Is there really any savings? Will new technology be invented before the life expectancy of the turbines ends? It seems to me that Pattern Energy could again be misleading the public and public officials with their statements that don't really reveal everything involved. **P216-15**

In 1997, the President's Council on Environmental Quality Issued Environmental Justice Guidance Executive Order 12898 and states that federal attention on environmental and human health conditions in minority and low-income communities. The order is further intended to promote non discrimination in Federal Programs substantially affecting human health and the environment and to provide for information access and public participation related to such matters. The DEIR/EIS has turned this article around and made it appear very non-descriptive and not adhered by guidelines of the intent of this order. The affected area is the town of Ocotillo and the DEIR/EIS should not be allowed to expand the affected area in order to make it look like the project is compatible to this directive. This is exactly why this order was made in to law. Ocotillo is the affected area, not El Centro. This executive order must be adhered **P216-16**

I demand that a **"No Project"** area not suitable alternative, be the only alternative approved. I'm hesitant to list the number because the numbers are different in the DEIR/EIS. Any other alternative is not acceptable, especially in a "Limited Use" area. Please don't allow demanding pressure from the bureaucracy to influence your decision. **P216-17**

Reviewing many of my own comments that I have previously sent, I have noticed many typographical errors that I inadvertently made because it was late at night and I was just plain tired. I work full time and spent many late hours researching and trying to read the DEIR/EIS. I do apologize for that. And that is a reason why the NEPA process is unfair to the people of small towns like Ocotillo. **P216-18**

In my opinion, to gain local public support for wind energy projects, the wind developers should try to think outside of the box, design projects with new innovative and pleasing ideas and design them to be more aesthetically pleasing without destroying sensitive desert ecosystems. And reiterating, locating WTG projects on "Limited Use" areas is unthinkable and will certainly result in wasting taxpayer money on expensive lawsuits. **P216-19**

Please let it be known that I agree with all comments by the Basin and Range Watch and the Desert Protective Council, all Indian Tribes among others. **P216-20**

Sincerely:
Parke Ewing
Parke Ewing
PO Box 84, 98 Imperial Hwy.
Ocotillo, Ca. 92259
(Ewingduo@aol.com)

October 6, 2011

To Whom It May Concern:

I'm writing in regards to the proposal about the windmills that are said to be put around the Ocotillo area. I don't think this project would be a very good idea, and I will state a few reasons why.

One of my reasons against this project is because of the animals that will be eliminated. I love animals, and I think they should have their own opportunity to live, just like us humans do. The paper stated that the bighorn sheep that resides in this area is already endangered, along with other animals that can be. Instead of killing the rest of these animals and taking them away from their homes, we should protect them like we would like to be protected if we were animals.

Another one of my reasons is that the area in Ocotillo that the windmills want to be built is an area with cultural artifacts. It's a natural land and we have no reason to build whatever we want there because it's not really ours, even if we buy it; its land and it's the world's. This reminds me a lot of how John Muir found Yosemite National Park and how he wanted to preserve it so others could see the wonders of this world. If we keep destroying lands and putting man-made buildings, and such, anywhere we want, we're killing our planet. Instead of letting Earth be itself, we build more machines and factories and facilities just to provide more jobs, when we don't realize that we're slowly killing our planet by all these things that we build that are said to supposedly help us. Ocotillo may not be filled with enormous green trees, waterfalls and huge mountains like Yosemite is, but that doesn't mean it's not beautiful. It's a beautiful land and I know that it's beautiful for the residents that live there because if it weren't, then they wouldn't live there.

P217-01

We all have different likes and opinions and the quiet desert land, west from El Centro, California, is a home to many residents and also to many creatures, that obviously can't have a say in this, and that is why we should look at it from their point of view. Do the residents from Ocotillo really want a huge change in their little town? Do they want their land to be destroyed or preserved? Don't you think they'd one day want their grand children and great grandchildren to see these fascinating creatures that might soon be extinct from this world? I think so; and I also think there are many other ways that we can generate, produce and distribute renewable energy without having to destroy the homes and even lives of others.

Please take my concern into consideration, thank you for your time.

Sincerely,
Leslie Palomino
Student at Imperial Valley College

From: babeofthedesert@juno.com [mailto:babeofthedesert@juno.com]
Sent: Thursday, October 06, 2011 5:26 PM
To: Perry, Cedric C; angelinahavens@co.imperial.ca.us
Subject: Ocotillo Wind Energy Facility

Hi my name is Laurel Ware. I am a resident of Ocotillo/No Mirage for over 28 years. After reviewing the two volumes provided by BLM, attending meetings, and evaluating available information about wind turbines and what can happen to the people and the environment near them I do not understand how this project could approved!!

Under Applicants'Objectives ES.2.4 clearly states - to locate the project on contiguous lands with High Wind Potential to maximize operational efficiency while minimizing environmental impacts.

ES.2.5 Develop a wind energy project on the windiest sites available to maximize energy production and provide the lowest cost renewable non-polluting electricity ensuring minimal environmental impact.

If you check the weather monitor's recorded wind measurements on S-2 in Ocotillo, one will find them to be too low to provide necessary wind to operate the turbines according to SDG&E'S requirements.

How can you minimize environment impacts while enclosing the Ocotillo/No Mirage area in on three sides with wind turbines?

We are an oasis, a fragile desert region with quiet scenic beauty, burial grounds, sacred sites and wildlife habitats.

P218-01

The data provided by Patton to BLM is inaccurate and the turbines would devastate and destroy the Ocotillo/No Mirage area.

We do not have the wind. Jobs are mentioned but how many will actually be provided to local residents? The ground will vibrate , there will be low frequency sound, flashing lights (day and night), health issues to residents and pets, bird and bat mortality, the risk of fire with the inability to extinguish such a fire with the risk of deterioration the whole unit could be catastrophic, and further devaluation of property just to name a few. WHERE WILL IT END?

I have read if instances of people within a 10 mile radius that have experienced health problems requiring them to vacate their homes. When they try to sell homes they have been devaluated up to 40 per cent, providing they can get a buyer to purchase the property as stated in an Ontario Canada CBC News investigation.

Along with devaluation of property there will be a reduction in tax revenue associated with that devaluation.

It is unconscionable to allow such a travesty that wind turbines would subject residents and creatures of this unique oasis and quality of life too.

I request denial of the proposed wind energy project!! Ocotillo/No Mirage is totally unacceptable for wind tribines!

Respectfully yours,

Laurel Ware

P218-01, cont.

Comment Letter P219

From: KIM PETERSEN [mailto:3muttmom@msn.com]
Sent: Wednesday, October 05, 2011 8:25 PM
To: Perry, Cedric C
Subject: wind

Dear Mr. Perry,

I would like to express my opposition to the Ocotillo Express Wind Project. I have visited this area and the nearby Anza-Borrego State Park quite frequently and cannot imagine that this magnificent desert area would be subjected to such use, with the resulting irreparable damage that would result. In addition to the 'eyesore' that it would become, I understand that it would:

- ☐ Devastate vital habitat for the Endangered Peninsular bighorn sheep, and the flat-tailed horned lizard — a perennial candidate for listing under the Endangered Species Act.
- ☐ Add significantly to the cumulative impact on the above species from other energy and agricultural projects in the area.
- ☐ Pose a serious threat of injury and death to golden eagles and other raptors known to live in the area, as well as the LeConte's thrasher, burrowing owls, several other sensitive bird species, and as many as twelve species of bats.
- ☐ Forever alter the wild character of the southern parts of Anza-Borrego Desert State Park, destroying its recreational qualities.
- ☐ Desecrate ancient Native cultural sites in the Yuha Desert cultural area, and interfere with the work of the soon-to-be-opened Imperial County Desert Museum.
- ☐ Turn the town of Ocotillo from a quiet, bucolic desert refuge to an industrial zone full of deafening noise 24 hours a day.
- ☐ Illegally alter the landscape surrounding the protected Juan Bautista de Anza National Historic Trail.
- ☐ Devastate those parts of Imperial County's economy that depend on tourism in the unspoiled desert.

P219-01

Please consider the "No Project Alternative" for this project! Please do not allow this area to become a wind energy resource. Please consider and acknowledge the current resourceful value that this beautiful area offers as it is.

P219-02

Sincerely,
Kim Petersen

From: Rosemary Cortez [mailto:rosemary_cortez@yahoo.com]
Sent: Thursday, October 06, 2011 3:25 PM
To: Perry, Cedric C; angelinahavens@co.imperial.caus; conrad@theabf.org
Subject: The Windmills

Good afternoon,

I was fortunate to camp at Anza-Borrego last spring and was amazed by the beauty of the landscape, flowering cacti, Bighorn Sheep, desert lizards, palms, ocotillos and so much more! Enjoyed the Palm Canyon Nature Trail, visited the Salton Sea and stopped to take in the view of the Borrego Badlands. What was amazing about Anza-Borrego was the unexpected waterfalls, the crystal clear starry nights, so much to explore and the variety of the topography!

I strongly oppose the construction of windmills because of the adverse impact this construction would have upon the Anza-Borrego environment such as the disruption of wildlife---birds, plants, small animals, and the rare Bighorn Sheep!

Please check into alternatives for producing renewable energy.

P220-01

Sincerely,
Rosemary Cortez
209.607.0092
rosemary_cortez@yahoo.com
1435 Crom Street
Manteca, CA 95337

From: Al DEVICO [mailto:adevico12@gmail.com]
Sent: Thursday, October 06, 2011 11:34 AM
To: Perry, Cedric C; angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us; conrad@theabf.org
Subject: The Ocotillo Express Wind Project

P221-01

My wife and I bought a home in Borrego Springs and moved here permanently last month. We have been visiting Anza Borrego Desert State Park every winter for the past ten years. We recognize Anza Borrego Desert State Park and the community of Borrego Springs as unique. We moved here because we were confident that this unique character would be preserved and protected in perpetuity. We are alarmed and disappointed to learn of the Ocotillo Express Wind Project. We believe the hasty approval of this project will result in devastating vital habitat. It will add significantly to the cumulative negative impact from other energy and agricultural projects in the area. A hasty decision without fully analyzing the impact will forever alter the wild character of the southern parts of Anza Borrego Desert State Park.

Please consider this public comment, and all others you receive, rather than shortchanging the advice of those the project will negatively impact. Please adopt the no project alternative. Please extend the public comment period by at least 30 days. Please hold additional public scoping meetings at which public statements will be allowed/encouraged. Find a way to use wind technology in the desert without permanently impacting a unique treasure. Thank you for considering all opinions.

Sincerely,

Alfred DeVico

From: Mike Beckage [mailto:mike.beckage@dtsweb.com]
Sent: Thursday, October 06, 2011 2:11 PM
To: Perry, Cedric C; angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Subject: The Ocotillo Express Wind Project

Dear Honorable Mr. Perry, Imperial County Planning Department, and Supervisors:

I am a frequent visitor to Anza Borrego State Park and Borrego Springs because of the rich biodiversity, lack of development and serenity that is so hard to come by in our modern world. The entire area in and around the park is a precious wilderness and haven for wildlife and humans alike. Any significant development, well intentioned or not, will degrade the overall natural heritage preserved in this region.

P222-01

I support alternative energy in general, including wind energy, however a project such as Ocotillo Express presents serious questions of appropriateness in an area where the impact of any development must by measured in a much broader sense. I therefore oppose the project and urge you to carefully consider my comments before deciding that you approve of the project.

In summary, I urge the BLM to adopt the “no project” alternative, extend the public comment period by at least 30 days, and please hold additional public scoping meetings at which public statements would be allowed.

Thank you very much for your consideration.

Michael Beckage
Vice President, Diversified Technical Systems, Inc.
Seal Beach, California, 90740

From: celia@fiddlegirl.com [mailto:celia@fiddlegirl.com]
Sent: Wednesday, October 05, 2011 8:40 PM
To: Perry, Cedric C
Cc: angelinahavens@co.imperial.caus
Subject: STOP THE WIND PROJECT!!!

October 5th, 2011
Dear Mr Perry, Ms Havens,Mr. Renison, Mr. Terrazas, Mr. Kelley,Mr. Wyatt, Mr. Castillo And Mr. Kramer

Please do not approve the proposed Wind Project.
I am a voting citizen and I do not want this project to impact our beautiful desert!!!!!!
It would…
- Devastate vital habitat for the Endangered Peninsular bighorn sheep, and the flat-tailed horned lizard — a perennial candidate for listing under the Endangered Species Act.
- Add significantly to the cumulative impact on the above species from other energy and agricultural projects in the area.
- Pose a serious threat of injury and death to golden eagles and other raptors known to live in the area, as well as the LeConte's thrasher, burrowing owls, several other sensitive birds species, and as many as twelve species of bats.
- Forever alter the wild character of the southern parts of Anza-Borrego Desert State Park, destroying its recreational qualities.
- Desecrate ancient Native cultural sites in the the Yuha Desert cultural area, and interfere with the work of the soon-to-be-opened Imperial County Desert Museum.
- Turn the town of Ocotillo from a quiet, bucolic desert refuge to an industrial zone full of deafening noise 24 hours a day.
- Illegally alter the landscape surrounding the protected Juan Bautista de Anza National Historic Trail.
- Devastate those parts of Imperial County's economy that depend on tourism in the unspoiled desert The Draft EIR/EIS is deficient because:

P223-01

- It does not include a "Distributed Generation" alternative
- Public comment was shortchanged due to a truncated "scoping" process I urge you to
- Adopt the "no project" alternative
- Extend the public comment period by at least 30 days
- Hold additional public scoping meetings at which public statements would be allowed.

P223-02

Sincerely
Celia Lawley
760/ 782-9202
POB 3
Santa Ysabel CA 92070

From: Gail.Adams@wellsfargo.com [mailto:Gail.Adams@wellsfargo.com]
Sent: Wednesday, October 05, 2011 7:55 PM
To: Perry, Cedric C
Subject: Wind Farm Near Anza Borrego Desert State Park
Importance: High

Please do not allow the wind park to be installed near Ocotillo Wells. It would severely impact one of the State's true treasures... the Anza Borrego State Park and the dark sky community of Borrego Springs. Thank you for your efforts on behalf of the citizens of these communities. **P224-01**

Gail M. Adams, Vice President

ph:206.892.9220 | fx:206.892.9201 | cell:206.465-7099

From: Gail.Adams@wellsfargo.com [mailto:Gail.Adams@wellsfargo.com]
Sent: Wednesday, October 05, 2011 7:55 PM
To: johnrenison@co.imperial.ca.us; angelinahavens@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us; conrad@theabf.org; Perry, Cedric C
Subject: STOP the Ocotillo Express Wind Turbine Project!
Importance: High

My husband, family and I are California residents and we are very concerned about the possible installation referred to as the Ocotillo Express Wind Turbine Project. Installing this project would seriously and negatively affect the Anza Borrego Desert State Park and the dark sky community of Borrego Springs.

P225-01

This area is unique and a true treasure of the State of California. It is the only place I know that you can see for miles and miles without the interruption of electrical lines, and other man made distractions that take away from our land's natural undisturbed beauty. The peace and calm felt while in the park and its surrounding neighborhoods should be preserved for this generation and generations to come. It is truly a special place that cannot be replicated.

Please say NO to the Ocotillo Express Wind turbine Project. Thank you.

Gail M. Adams

206-285-1582

206-465-7099

Comment Letter P226

From: Susan Massey [mailto:susanlil_8@yahoo.com]
Sent: Thursday, October 06, 2011 8:23 AM
To: Perry, Cedric C; angelinahavens@co.imperial.ca.us
Subject: public comment on the Ocotillo Wind Energy Facility

Attached please find my comments on the proposed Ocotillo Wind Energy Facility. Thank you for including it in the public record.
Susan Massey

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT/REPORT FOR THE OCOTILLO WIND ENERGY FACILITY

Reading the EIS/EIR for the Ocotillo Wind Energy Facility, it is clear that the Ocotillo/Nomirage area has been chosen as a sacrifice area in order to meet goals of creating jobs and developing renewable energy to decrease greenhouse gases. While these are valid goals, they could be met by other less destructive means. Instead of backing a loan for Pattern Energy, they could back loans for individuals to insulate their homes, to put solar panels on their roofs and back loans for businesses to build solar panel covered parking ramadas. The loans could be paid back with money saved on electricity. This would accomplish the goals of reducing greenhouse gases, providing jobs and would also make life more pleasant for Imperial Valley residents during the summer. I believe this should be listed as a project alternative.

Sacrifice is a strong word, but there is justification for using it. County officials may be familiar with the Ocotillo/Nomirage area, but officials in BLM living in Washington are not. There are two things that make the area an attractive place to live: beautiful views and quietude.

I am inserting two pictures I took right outside of Ocotillo the spring of 2010. While the photos in the EIS are much more professional than mine, they do not capture the beauty of the colors of the mountains in early morning and late afternoon light nor the colors of the vegetation in the spring.

P226-01

In analyzing six key observation points the EIS/EIR finds that the visual change in each case would be moderate to high and would "substantially degrade the existing visual character or quality of the site and the surrounding landscape." (These words are repeated throughout Section 4.18 Visual Resources.) Table ES-1: Comparison of Impacts by Alternative states that the visual impacts for Alternatives 1, 2 and 3 are "Temporary and permanent degradation from visual changes."

P226-02

As far as the quietness goes, that is also being sacrificed to build this project. On page 4.9-7 of the Noise section it states ". . . these noise levels would result in a substantial increase over nighttime ambient noise levels occurring in the quieter areas (away from highways) and would be perceived as a doubling of loudness (>10 dBA Leq increase). . . . Therefore, these noise levels may result in complaints from local residences." On page 4.9-11, in discussing CEQA criteria , it states ". . . these noise levels may result in widespread complaints from local residences resulting in a significant and unavoidable impact under Criterion NZ-1" **P226-03**

So the two best qualities of the area are clearly being sacrificed to make way for this project. Knowing several people who live in the area on very low incomes, I carefully read the section on Environmental Justice. I see that according to the BLM criteria for the demographics needed for environmental justice to be considered an issue this area doesn't qualify. However, I notice the comment on page 3.5-1 stating that "The approach in this EIS/EIR is to achieve compliance with the letter and the spirit of the President's Executive Order by addressing the question of whether and how the impacts of the Proposed Action and alternatives my disproportionately affect minority and low income populations."

I challenge that the methodology and the data applied here is following the spirit of the law and possibly the letter of the law.

I don't question that the Ocotillo/Nomirage area doesn't qualify on the basis of having a high minority population. However the consideration of it being in a low income area is thrown out in the analysis on the basis of census tract block groups (page 4.5-2). There is no map of the these block groups nor explanation of what areas they include. Please provide this information in the final document. **P226-04**

(Online maps of census tracts and block groups are difficult to decipher)

The Environmental Justice section relies only on 2000 Census data. This is understandable as this work may have been done before the 2010 census was even completed. However the last decade has brought radical economic and demographic changes to the state and to this area of Imperial County. It is now October of 2011, so please include data from the 2010 census.

I have been unable to find official 2010 census data for Ocotillo in relation to income and age. As a federal agency I'm sure that you will be able to obtain it.Using data from the Census Bureau's American Fact Finder and from several other online sources I've put together the following profile of the area.

October 5, 2011

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov

Re: Ocotillo Express Wind Energy Project
CASE FILE NUMBER: CACA051552
DOCUMENT NUMBER: CA-670-2010-032

Dear Mr. Perry:

Bottom Line:

- BLM should adopt the "no project" alternative
- Stunningly bad site choice for this type of project
- Project would forever ruin the precious AND irreplaceable desert view shed
- BLM should extend the public comment period by *at least 30 days*
- BLM should hold additional public scoping meetings at which public statements would be allowed
- Project would forever ruin the wild landscape of southern parts of Anza-Borrego Desert State Park
- Project would devastate vital habitat for the Endangered Peninsular bighorn sheep, and the flat-tailed horned lizard, a rapidly disappearing species likely to be listed as an Endangered Species in the near future
- Project would create serious economic damage in surrounding areas whose tourism relies on a sense of the wild desert

P227-01

For decades, I have played in and been renewed spiritually and emotionally by the wild landscapes and wild ecosystems that would be *permanently destroyed* by this industrial, jarring IRON CURTAIN of 105-155 wind turbines covering 15,000 acres (15,000!!!).

P227-02

The siting for this project is all wrong. The BLM should adopt the "no project" alternative. This project at its current site will *forever alter* the cherished wild character of the southern parts of Anza-Borrego Desert State Park. While alternative energy is a worthy pursuit in general, this SPECIFIC project is in the wrong place. The cost of one company making a profit here would be at the expense of depriving the rest of us and our children of the irreplaceable experiences of maintaining the character of this wild desert area. *BLM land is public land, our lands.* This is a short-sighted, bad use of public land.

P227-03

The proposed project will devastate vital habitat for the Endangered Peninsular bighorn sheep, and the flat-tailed horned lizard, a rapidly disappearing species. These impacted 15,000 acres will add significantly to the cumulative impact on the above species from other energy and agricultural projects in the area. **P227-04**

Regarding birds, this site poses a serious threat of injury and death to golden eagles and other raptors known to live in the area, as well as the LeConte's thrasher, burrowing owls, several other sensitive bird species, and as many as twelve species of bats. **P227-05**

The proposed project would turn the town of Ocotillo from a quiet, bucolic desert refuge into an industrial zone full of deafening noise 24 hours a day. It would devastate those parts of Imperial County's economy that depend on tourism in the unspoiled desert. Added to that, the project would illegally alter the landscape surrounding the protected Juan Bautista de Anza National Historic Trail. **P227-06**

The Draft EIR/EIS is deficient because it did not include a "Distributed Generation" alternative and the public comment was shortchanged due to a truncated "scoping" process. **P227-07**

- In closing, I most strongly urge the BLM to take the following three actions:
- Adopt the "no project" alternative
- Extend the public comment period by at least 30 days
- Hold additional public scoping meetings at which public statements would be allowed

P227-08

Thank you for your serious consideration,

Kate Harper

Kate Harper
President
Harper Business Solutions

From: Patricia Campbell [mailto:2bws@earthlink.net]
Sent: Thursday, October 06, 2011 11:10 AM
To: Perry, Cedric C
Subject: Proposed Ocotillo Wind Energy Farm - PLEASE DO NOT APPROVE THIS PROPOSED PROJECT

Oct. 06, 2011

Dear Mr. Perry,

We are writing to implore you to adopt the "no project" alternative to this proposal. The Anza-Borrego area is one of our favorite places. It is a place where you can almost feel as if you have gone back in time and can breathe and see nature in a special way. The beauty is both stark and majestic! It is a place that one can view wildlife in its habitat. We have been lucky enough to see desert bighorn sheep while walking a trail. It is something we will never forget! We hate to think of the nearly pristine area being blighted by a wind farm.

P228-01

In addition to the beauty that would be marred, there is the negative impact on the wildlife in the area were a wind farm to be built. Wind turbines kill raptors. They kill bats. These are creatures that we need as a part of a healthy ecosystem.
Additionally, other wildlife and plants would be killed or harmed by the construction of the wind farm.

Please look at the special treasure that is Anza-Borrego and do not approve this wind farm. This project is not necessary. There are other alternatives for energy in the area. Please adopt the the no-project alternative in order to protect 12,000 acres of intact desert habitat from destruction. We would hate to see the irreparable damage to the area that this project would cause.

Please consider our plea and protect the land and its wildlife.

Sincerely,

John and Patricia Campbell
24 Elm Ave.
Kentfield, CA 94904

Comment Letter P229

From: Carol Black [mailto:cblackgolf@hotmail.com]
Sent: Wednesday, October 05, 2011 4:42 PM
To: Perry, Cedric C
Cc: info@theabf.org
Subject: Proposed Ocotillo Wind Energy Facility

Dear Cedric,

I am writing in opposition of the installation of the proposed Ocotillo Wind Energy Facility on land directly adjacent to the community of Ocotillo. As a seasonal resident in Borrego Springs, and as an archeology steward volunteer in Anza-Borrego Desert State Park as well as a field botanist in training, I value the natural environment that is preserved within the Park.

The installation of the proposed 155 wind turbines located contiguous with the southwestern border of ABDSP, creates a hazard to the fauna located in the area as well as contaminating cultural sites which are irreplaceable. The destruction of intact, pristine desert habitat for private profit compromises the legacy that the park was created to preserve. The proximity of towers is inconsistent with the state's intent to protect the environment for the public use. **P229-01**

My understanding is that the project is not needed at this time, given that the draft EIS does not meet the NEPA requirements because it lacks a full range of alternatives.
Power produced on rooftops in cities where the energy is used is long overdue in the San Diego area. This project is not needed in this location. The BLM should consider a "no project" alternative. The BLM is mandated to consider viable alternatives that could meet the "need" for the project that lie outside of lands within their jurisdiction. **P229-02**

Adopt a no-project alternative and protect 12,000 acres of pristine desert environment from destruction for private profit. Thousands of people who treasure public lands will applaud your decision to protect their interests. Count me as just one... **P229-03**

Respectfully,

Carol Black

From: Gene Trapp [mailto:grtrapp@comcast.net]
Sent: Wednesday, October 05, 2011 6:10 PM
To: Perry, Cedric C
Cc: johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Subject: Please say "No" to the Ocotillo Express Wind Energy Project

To: Mr. Cedric Perry and the Imperial County Board of Supervisors

P230-01

My family and I live in Davis, CA, and we cherish the many times over the years that we have visited beautiful Anza-Borrego Desert State Park (ABSP). We love the desert and its abundance of wildlife and fascinating plant life. We have examined the EIR and are disturbed by the extent and large number of wind turbine generators (WTGs) to be placed so close to the Park. Here are our comments:

We ask that you select the "No Project" alternative.

The public comment period should be extended at least 30 days.

There should be additional public scoping meetings.

There should not be WTGs in Peninsula Bighorn Sheep "essential habitat". These should also be well away from the southwest lambing area. One of my students conducted research on the Peninsula Bighorn Sheep in ABSP.

There will be a significantly increased mortality of resident Golden Eagles and migrating hawks and other birds through the OWEF area. Bats are also bound to be killed by WTGs when they hunt in that area. It would be much better if the WTGs could be cylindrical (vertical) wind turbines that would not kill any birds or bats. We wonder if this design has been considered?

There will be significant damage to the habitat of the endangered Flat-tailed Lizard.

There should be a larger buffer zone between the Anza-Borrego State Park boundary and the nearest WTGs.

There will be a negative visual impact on the unspoiled desert, and therefore, on Imperial County tourism.

There will be a significant negative impact on the wilderness character of southern ABSP.

Thank you very much for considering our comments.

Sincerely,

Gene R. Trapp, PhD
Professor Emeritus
Department of Biological Sciences
California State University, Sacramento
grtrapp@comcast.net

Home address:
2313 Isle Royale Lane
Davis, CA 95616

Comment Letter P231

From: Jim & Connie Spears [mailto:conniejim@gmail.com]
Sent: Wednesday, October 05, 2011 10:55 PM
To: Perry, Cedric C; angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Subject: Opposition to The Ocotillo Express Wind Project

Dear Mr. Perry, Ms. Havens, and Imperial County Board of Supervisors,

I am writing this letter to oppose the destructive wind power development slated near Anza-Borrego Desert State Park's southeastern border near Ocotillo.

This project is adjacent to Anza-Borrego Desert State Park, California's largest state park, designated as part of the world biosphere reserve. This is a gigantic, ill-conceived project in an irreplaceable desert habitat.

I am a resident of this area and want to see this fragile desert ecosystem protected from these development projects.

P231-01

Impacts to Natural Resources of Anza-Borrego Desert State Park include:

1. Disruption of wildlife corridors for desert bighorn sheep.
2. Adverse effects to golden eagles due to the birds striking the turbines.
3. Adverse impacts to burrowing owls, long-eared owls, Vaux's swift, peregrine falcons, flat-tailed horned lizards, barefoot geckos, Red diamond rattlesnakes, American badgers, and several listed plant species.
4. Could cause significant deaths of bats due to the drop in air pressure causing internal hemorrhaging in the lungs as well as deaths from direct strikes.
5. Unavoidable impact to plants during construction and the introduction of invasive plant species.
6. Permanent scarring to the landscape leaving an "industrial" look to the area.

P231-02

Impacts to Cultural Resources of ABDSP:

1. Visual impacts to the newly designated Cultural Preserve at Piedras Grandes, just west of Ocotillo and its "sacred site."
2. No adequate accounting for impacts to the multiple cultural resources of the area when viewed as a cultural landscape.
3. Cultural Studies not completed prior to assessing impacts.

P231-03

Other Potential Impacts

1. Substantial increase in noise levels from the operation of the turbines, especially at night in surrounding areas.
2. Impacts to air quality from truck traffic and from concrete batch plants.
3. Increased risk of wildfire hazards.
4. Loss of soil's ability to absorb carbon from scraping.
5. Degradation to the recreational and natural experience of ABDSP by the sight of the turbines and associated facilities.
6. Loss of dark night skies.
7. Degradation of wilderness character of the several BLM wildernesses surrounding the proposed project.

P231-04

The NEPA Document does not include an alternative for production of renewable energy at point of use in cities and thus the Draft EIR/EIS is incomplete.

Please adopt the "no project" alternative and protect this important desert habitat from devastation by private industry for private profit!

P231-05

Thank you for opposing this project!

Sincerely yours,

Connie Spears

Comment Letter P232

-----Original Message-----
From: frizzell@umbc.edu [mailto:frizzell@umbc.edu]
Sent: Thursday, October 06, 2011 1:30 PM
To: Perry, Cedric C
Cc: angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us; conrad@theabf.org
Subject: Opposition to the Ocotillo Express Wind Project

Dear Mr. Perry:

I would like to voice my opposition to the Ocotillo Express Wind Project.

Speaking as a tax payer and as someone who has hiked and camped in the beautiful Anza Borrego wilderness, I strongly feel that this desert should remain protected and pristine. Such objectives could hardly be accomplished with the placement of this expansive windmill project.

Other serious detriments of the Ocotillo Wind Project would include:

- Devastating vital habitat for the Endangered Peninsular bighorn sheep, and the flat-tailed horned lizard - a perennial candidate for listing under the Endangered Species Act.

- Adding significantly to the cumulative impact on the above species from other energy and agricultural projects in the area.

- Threats of injury and death to golden eagles and other raptors known to live in the area, as well as the LeConte's thrasher, burrowing owls, several other sensitive birds species, and as many as twelve species of bats. **P232-01**

- Permanent alterations of the wild character of the southern parts of Anza-Borrego Desert State Park, destroying its recreational qualities.

- Desecration of ancient Native cultural sites in the Yuha Desert cultural area, and interference with the work of the soon-to-be-opened Imperial County Desert Museum.

- Turning the town of Ocotillo from a quiet, bucolic desert refuge to an industrial zone full of deafening noise 24 hours a day.

- Illegally alter the landscape surrounding the protected Juan Bautista de Anza National Historic Trail.

- Devastating those parts of Imperial County's economy that depend on tourism in the unspoiled desert

Additionally, the Draft EIR/EIS is deficient because:

- It does not include a "Distributed Generation" alternative **P232-02**
- Public comment was shortchanged due to a truncated "scoping" process

I urge the Bureau of Land Management to: 1) Adopt the "no project"
alternative and 2) Extend the public comment period by at least 30 days **P232-03**

Please keep the Anza Borrego region free from this destructive project.

Sincerely,
Michael A. Frizzell

Comment Letter P233

From: Stacy Kline [mailto:stacykline@gmail.com]
Sent: Wednesday, October 05, 2011 11:08 PM
To: Perry, Cedric C; angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Subject: Opposition to The Ocotillo Express Wind Project

Dear Mr. Perry, Ms. Havens, and Imperial County Board of Supervisors,

I am writing this letter to oppose the destructive wind power development slated near Anza-Borrego Desert State Park's southeastern border near Ocotillo.

This project is adjacent to Anza-Borrego Desert State Park, California's largest state park, designated as part of the world biosphere reserve. This is a gigantic, ill-conceived project in an irreplaceable desert habitat.

Our family is a frequent visitor of this area and we want to see this fragile desert ecosystem protected from these development projects.

P233-01

Impacts to Natural Resources of Anza-Borrego Desert State Park include:

1. Disruption of wildlife corridors for desert bighorn sheep.
2. Adverse effects to golden eagles due to the birds striking the turbines.
3. Adverse impacts to burrowing owls, long-eared owls, Vaux's swift, peregrine falcons, flat-tailed horned lizards, barefoot geckos, Red diamond rattlesnakes, American badgers, and several listed plant species.
4. Could cause significant deaths of bats due to the drop in air pressure causing internal hemorrhaging in the lungs as well as deaths from direct strikes.
5. Unavoidable impact to plants during construction and the introduction of invasive plant species.
6. Permanent scarring to the landscape leaving an "industrial" look to the area. Impacts to Cultural Resources of ABDSP:

P233-02

1. Visual impacts to the newly designated Cultural Preserve at Piedras Grandes, just west of Ocotillo and its "sacred site."
2. No adequate accounting for impacts to the multiple cultural resources of the area when viewed as a cultural landscape.
3. Cultural Studies not completed prior to assessing impacts.

P233-03

Other Potential Impacts:

1. Substantial increase in noise levels from the operation of the turbines, especially at night in surrounding areas.
2. Impacts to air quality from truck traffic and from concrete batch plants.
3. Increased risk of wildfire hazards.
4. Loss of soil's ability to absorb carbon from scraping.
5. Degradation to the recreational and natural experience of ABDSP by the sight of the turbines and associated facilities.
6. Loss of dark night skies.
7. Degradation of wilderness character of the several BLM wildernesses surrounding the proposed project.

P233-05

The NEPA Document does not include an alternative for production of renewable energy at point of use in cities and thus the Draft EIR/EIS is incomplete.

Please adopt the "no project" alternative and protect this important desert habitat from devastation by private industry for private profit!

P233-05

Thank you for opposing this project!

Sincerely yours,

Stacy & Greg Kline

Comment Letter P234

From: Larry Banks [mailto:larrybanks0@gmail.com]
Sent: Wednesday, October 05, 2011 5:17 PM
To: Perry, Cedric C
Subject: OEWEP

Oct 5, 2011
Mr. Perry
Re: OEWEP

!) Is there documentation that demonstrates the need for additional electrical generation at the proposed site? P234-01
2) Have alternatives such as solar power been considered? P234-02
3) Has there been a seismic risk study? P234-03
4) Are there alternatives to any toxic materials used in the towers? P234-04
5) Have alternative sites been considered? P234-05

These need to be seriously considered prior to any approval to proceed with the project.

Larry Banks

From: Wilma Katz [mailto:wilmak5@verizon.net]
Sent: Thursday, October 06, 2011 11:52 AM
To: Perry, Cedric C
Cc: angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Subject: Ocotillo Wind Project

123 Jose Gaspar Drive
Englewood, FL 34223
October 6, 2011

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Mr, Perry,

I am writing in opposition to the Ocotillo Express Wind Project. I urge the BLM to adopt the "no project" option on this application.

I had the opportunity to visit Anza-Borrego Desert State Park in April, 2011. Staying in Borrego Springs, a friend and I enjoyed several days of hiking there before a meeting in San Diego. We are from Florida and found the dry desert air exhilarating. However, the most memorable aspects of our visit were the quiet, particularly at night, and, of course, the magnificence of the night sky.

I was alarmed to learn recently of the Ocotillo Wind Project proposed near the State Park's southeastern border. Clearly it is imperative that we as a nation shift to renewable energy, both for our own well-being and to fulfill our leadership responsibilities internationally. At the same time, there are enormous risks in rushing approval for or poorly situating new technology, as seems to be happening here.

P235-01

Conceptually, I am an enthusiastic supporter of wind turbines. Their placement is a huge concern, though, because of impacts on wildlife from the blades and on wildlife *and* people from the noise. With time and additional research and innovation to address these concerns, locating the turbines surely will be less problematic.

The proposed placement of this project is complicated by other factors, among them the effects, some unknown, on the natural environment in general and on multiple sensitive and/or protected species in particular; and impacts to Native American cultural sites, to the character of Ocotillo itself, and on area tourism, vital to the local economy. I am thinking of impacts during construction as well as others that basically would be perpetual.

This project proposes to directly use public lands and it will affect also additional adjacent protected public lands. Careful and thorough consultation by agencies as well as a lengthy comment period for public input is appropriate. Unfortunately, the approval process for this project appears rushed. That does not bode well.

At a minimum, I urge you to extend the public comment period and provide significantly more opportunities for public meetings and discussion.

P235-01, cont.

Sincerely,

Wilma Katz

CC: Angelina Havens, Imperial County Planning Department

John Renison, Jack Terrazas, Michael W. Kelley,Gary Wyatt, Ray Castillo, Imperial County Board of Supervisors

Comment Letter P236

From: Renee Cox [mailto:reneecox@cox.net]
Sent: Wednesday, October 05, 2011 4:49 PM
To: Perry, Cedric C
Cc: johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.cas.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us; angelinahavens@co.imperial.ca.us; conrad@theabf.org
Subject: Ocotillo Wind Farm

Dear Mr. Perry - I am submitting comments regarding the planned Ocotillo Wind Farm. I am very upset that this wind turbine farm is planned for an area adjacent to the Anzo Borrego State Park. We have visited every year as a family and enjoy the desert beauty there at all times of the year. I believe the wind farm would destroy both the view and the habitat for many native species, including both plants and animals. While I am for developing alternative forms of energy, it appears this energy production would be both short term and for profit and would create permanent damage to the land. I am also disturbed that so little time for public comment was given. The whole area is a really special one for our family and many of us here in Southern California and I would hate to see it despoiled by wind turbines. Please do not approve this project. Thank you. Renee Cox and family

P236-01

From: Pea Hicks [mailto:phix@optigan.com]
Sent: Wednesday, October 05, 2011 9:31 PM
To: Perry, Cedric C
Subject: Re: Ocotillo Wind Energy Facility

To Cedric Perry:

I would like to add my voice to those concerned about plans to build a wind farm along the S2 near Ocotillo, CA. This is a gorgeous part of our local desert, and I personally have hiked in this area for the past 30 years. Altering this landscape with unsightly wind turbines would be a travesty, especially since as I understand it, there are alternate technologies available to achieve the same goals without ruining the view. Please do whatever is possible to prevent this project from going forward. **P237-01**

Thank you,
Dan Hicks
San Diego, CA

From: alan madrigal [mailto:alan_madrigal1@hotmail.com]
Sent: Wednesday, October 05, 2011 8:05 PM
To: Perry, Cedric C; angelinahavens@co.imperial.ca.us
Subject: Ocotillo Express

I believe the Ocotillo Express Wind Energy Project is a good idea but poorly elaborated. The idea of generating more reliable, cheap, and efficient energy sounds great, but the only problem with plan is that it will ruin California's largest state park which is irreplaceable. In other words, I am with the " No Project " alternative just to save a national treasure. **P238-01**

From: Jerry J Hutchins [mailto:jjh1@cox.net]
Sent: Wednesday, October 05, 2011 9:06 PM
To: Perry, Cedric C
Subject: Ocotillo Express Wind Turbine Project

I am opposed the proposed Ocotillo Express Wind Turbine Project.
This project is not needed. Local rooftop and local distributed renewable energy generation could power the 140,000 homes that this project is slated to power. Adopt the no-project alternative and protect 12,000 acres of intact desert habitat from destruction for private profit on a project that will be de-commissioned in 30 years! If this project goes through, there will be irreparable damage to the landscape.

P239-01

Thank you,

Jerry Hutchins

--

Jerry Hutchins
Email: jjh1@cox.net

"Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances. " James Madison - 1st Amendment United States Constitution – September 25, 1789

From: Gregg Littell [mailto:kwikfishk15@yahoo.com]
Sent: Wednesday, October 05, 2011 2:32 PM
To: Perry, Cedric C
Subject: Ocotillo Express Wind Turbine Project.....NO!!

Please don't allow the OEWTP to proceed! That area needs to be protected, both in viewshed and resources. There are more appropriate places for wind turbines. The Altamont Pass Wind Farm is an example of placing these where the viewshed and resources are not deserving of special consideration. Once you do it, you can't bring it back, so consider this carefully. Thanks! **P240-01**

Gregg Littell
Auburn, CA.

From: Beth Chafey-Hon [mailto:chafeyhon@netnet.net]
Sent: Thursday, October 06, 2011 5:32 AM
To: Perry, Cedric C; angelinahavens@co.imperial.caus
Subject: Ocotillo Express Wind Project

Dear Mr. Perry and Imperial County Planning Dept,

My husband and I have owned a house in Unit 1 of Ocotillo, CA since the 1970's. We have used the house for weekend vacations and retreat. We have explored the Coyote Mountains, canyons and other natural beauties of the area. Putting in this wind farm would completely ruin the value of time we spend there. I value of our home has gone down, yes, but I think with the wind farm, it would completely devalue it completely. These are selfish reasons against the wind farm. We are all aware that the fragile desert ecosystems, wildlife and the whole natural beauty of the desert would be destroyed in time. **P241-01**

Please vote against this project.
Thank you for your consideration,

Beth and Bob Hon
53 Cactus Ave.
Ocotillo, CA
920-823-2223

Comment Letter P242

From: dean frazer [mailto:deanfrazer@yahoo.com]
Sent: Thursday, October 06, 2011 12:42 PM
To: Perry, Cedric C
Subject: Ocotillo Express Wind Project

Dear Mr. Perry, I am writing to state my opposition to the Ocotillo Express Wind Project. Though an advocate for alternative energy sources, this project clearly impinges upon Anza-Borrego State Park and , thus, risks irreparable damage tothe crown jewel of the California state park system. Though a Californian for the bulk of my 71 years, I presently live in Prescott AZ and see daily how poor planning and economically based decisions do devastation to the fragile landscape of our arid and desert lands. Anza-Borrego hasbeen a treasure to millions for its natural beauty, its wildlife and for the very fact that a visit there takes you to a level of solitude rare to be found in the modern Southwest. The BLM has a clear and concrete responsbility to protect our public lands and to preserve the sanctity of our national treasures. I support wind and solar projects in our vast West andhave faith they will be a path to a better future. But, in this instance, proximity is everything--------and, this project is simply cheek to jowl with the fragile and delicate environment that is Anza-Borrego. I have hiked and biked and ridden back-country roads in Anza-Borrego. I havebeenthrilled toseemountain sheep and hidden palm canyons. Please help assure that upcoming generations will receive thesame opportunities and make their own beautiful memories. Thank you for your attention, Dean G. Frazer

P242-01

October 6, 2011

Cedric Perry, Project Manager
Bureau of Land Management
Ocotillo Wind Express Project
22835 Calle San Juan Los Lagos
Moreno Valley, California 92553
cperry@blm.gov

SUBJECT: DEIS Comments for Ocotillo Wind Express

The following comments apply to the proposed Ocotillo Express Wind Energy Project Draft Environmental Impact Statement (DEIS) CASE FILE NUMBER: CACA051552 DOCUMENT NUMBER: CA-670-2010-032.

CULTURAL RESOURCES

According to the DEIS, 20,000 lithic knapping stations are found within the project site, numerous prehistoric trails, 48 camp sites, hearths, cremations (some with human remains), dance circles, a possible fish geoglyph, ceramic shards, numerous agave roasting pits, sleeping circles, milling stones, cairns, and rock alignments of various shapes (one triangular). The entire northwestern part of the project site is described as an agave procurement area, with numerous agave roasting sites, some covering acres and containing many pits. One area had 108 pits for roasting agaves. This is only part of what is out there in that area. This list is only that which has been identified. There are resources which have not been included in the survey but are just as important part of the history of the Native People who still live in the area. This whole area is very rich in cultural artifacts, and should not be disturbed on such a large scale, with roads and industrial constructions zones. Lay down yards for wind turbine generator equipment could fragment this important cultural landscape greatly. Unknown finds may be destroyed. *This area should be protected as an Area of Critical Environmental Concern, along with the adjacent eastern areas where the prehistoric shorelines of Lake Cahuilla exist.* Mitigations proposed do not protect these resources. The only mitigation would be to NOT DISTURB these ancient historic sites at all, but instead, study and identify the historical record of these ancient peoples. To do otherwise is to disrespect a 12,000-year population that has suffered at the hands of Europeans for the last 500 years. **P243-01**

Thank you for your consideration.

Sincerely,

Helena Quintana Arrow-weed
1726 W. Brighton Ave. #A
El Centro, CA 92243
760-540-0789 cell
helena_quintana@yahoo.com

From: Jane Higginson [mailto:jane.higginson@imperial.edu]
Sent: Wednesday, October 05, 2011 1:00 PM
To: Perry, Cedric C; angelinahavens@co.imperial.ca.us
Subject: ocotillo wind expess comment
Importance: High

Hello,

I have attached my comment on the Ocotillo Wind Energy Facility (Ocotillo Express). Please adopt the "no project " alternative. Please extend the public comment period by at least 30 days. P244-01

Thank You,

Jane Higginson
Instructor of Environmental Science
Imperial Valley College
phone: (760) 355-5751, ext. 6751
jane.higginson@imperial.edu
office: room 2779

Comment Letter P244

October 5, 2012

To Whom It May Concern:

I am writing to oppose the proposed giant wind energy project, Ocotillo Wind Energy Facility, AKA, Ocotillo Express. Only a person or agency who is intentionally ignoring the environmental and social impact facts could support such a project. If implemented, it will permanently destroy the desert ecosystem of Ocotillo as well as have a huge negative impact on the human residents of the area and on ecotourism. **P244-02**

Wildlife impacts were neither thoroughly analyzed nor thoroughly mitigated. One of many examples is that there do not appear to be mitigations for bats, which are known to not only be killed by wind turbines, but actually are attracted to them (see www.batsandwind.org). According to Edward B. Arnett, *et al*, bat mortality due to wind turbines are of concern to the overall outlook for bat populations at this time because many bat species are known or suspected of being in decline (Front. Ecol. Environ. 2011; 9(4):209-214. Published online 1 Nov. 2010). As many as twelve species of bats occur, or have potential occurrence in the project area. Many other species of wildlife will be impacted, such as the desert bighorn, the flat-tailed horned lizard, the golden eagle, the Le Conte's thrasher, and the burrowing owl. The cumulative impacts to wildlife due to other projects in the area, such as the Sunrise Power link, seem to have been grossly underestimated or ignored. **P244-03**

In addition to the physical impacts of this project (e.g., noise, aesthetics, vibration, electromagnetic field exposure, and damage to cultural resources) on the human community of Ocotillo as well as desert-loving visitors to the area, another societal impact as that is *very* disturbing is the fact that residents who would be affected most by the project were prevented from voicing their views at recent public meetings about the project in El Centro and Ocotillo. I attended one of these meetings and I also noticed that literature was being distributed that did not accurately present the impacts to wildlife caused by wind turbines and underplayed potential human health impacts. This all has the *appearance* that big corporate entities and big $$$ are controlling the decision process, rather than local citizens. This is *extremely undemocratic*. **P244-04**

I have worked in and enjoyed recreating in Anza-Borrego Desert State Park, Imperial Valley, and the Ocotillo desert for decades, and so I know that this wind turbine project would be a heartbreaking act of violence to this very special place. I strongly urge the BLM to adopt the "no project" alternative to the wind project, to extend the public comment period by at least 30 days, and to hold additional public scoping meetings at which public statements would be allowed. Furthermore, as we make a *much needed* transition to a "low-carbon society", let us ***NOT*** continue to follow the model of big centralized energy (and big centralized money and power) that was set in place by the fossil-fuel industry. Let us instead restructure our society for energy conservation, and produce energy reliably, cheaply, safely, and sustainably with roof-top solar and other distributed renewable energy sources *in the communities where the power will be used.* **P244-05**

Sincerely,

Jane Higginson
Master of Regional/Environmental Planning
Instructor of Environmental Science, Imperial Valley College
Wildlife Biologist and Ecological Designer, Archelonia Ecological and Permaculture

From: Paul Woolery [mailto:pwoolery@cox.net]
Sent: Wednesday, October 05, 2011 11:01 AM
To: Perry, Cedric C
Cc: angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; garywyatt@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Subject: Ocotillo Express Wind Turbine Project

Gentlemen,

I'm sure by this time you have received hundreds of negative emails regarding the Ocotillo Wind Turbine Project. My concern is not the visual impact or the possible loss of wildlife. The wildlife will move to the surrounding areas during construction. Proper construction monitoring should limit the impact to snakes and lizards during construction phase. The location of the wind farm in necessary because of the wind and the proximity to major power lines.

My main concern is that access to the Anza-Borrego State Park in the Dos Cabezas area will be restricted. Sense high school I have enjoyed camping, hiking and just relaxing in the southern part of the park. Fifty years later I still enjoy this part of the park. I have introduced my wife, children and grandchildren to this wonderful wilderness. I use Dos Cabeza Rd through BLM land to access Dos Cabeza spring and camp. **P245-01**

The need for renewable energy, jobs and investment in our future is important. I for one can live with the wind farm as long as I can still access the southern area of Anza-Borrego State Park. I support this project providing access to the park is maintained.

Paul Woolery

From: Callie Mack [mailto:calliemack@sbcglobal.net]
Sent: Wednesday, October 05, 2011 10:26 AM
To: Perry, Cedric C
Cc: angelinahavens@co.imperial.ca.us; johnrenison@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; garywyatt@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; raycastillo@co.imperial.ca.us
Subject: Ocotillo Express wind project is ill-advised and in a poorly chosen location

Dear Mr. Perry:

I'm writing to urge the BLM to disallow the Ocotillo Express wind project. This project has been pushed ahead on a fast and sneaky track, with little opportunity for public comment and participation. Frankly, given its location and its impact on the surrounding community and environment, this project should not be built at all. Here are some of the reasons why: **P246-01**

- Ocotillo Express has the potential to destroy vital habitat for the endangered Peninsular bighorn sheep, as well as the flat-tailed horned lizard, a perennial candidate for listing under the Endangered Species Act. Other energy and agricultural projects are already having impacts on these species. They don't need further pressure. **P246-02**

- Huge wind farms have been shown to be devastating to bird populations. Ocotillo Express poses serious threats to raptors (such as golden eagles), burrowing owls and other sensitive bird species, and bat populations. **P246-03**

- This giant, noisy, ugly wind farm will be located right next door to Anza-Borrego Desert State Park, the crown jewel of our State Park system. When I visit Anza-Borrego, I don't want to see - and hear - vast armies of wind turbines marching down the landscape, like those that have despoiled the Coachella Valley area. Local tourism will be impacted, as visitors aren't going to want to visit or camp in areas close to giant wind farms. The park's viewshed and buffer zone should be protected and respected. **P246-04**

- The project will seriously impact Native American cultural sites in the area and interfere with the work of the new Imperial County Desert Museum. It will also illegally alter the landscape around the Juan Bautista de Anza National Historic Trail. **P246-05**

Your draft EIR/EIS didn't even bother to include a "distributed generation" alternative, and the scoping process was limited, resulting in less opportunity for public comment. (Was this deliberate?)

I do believe that alternative energy projects, such as wind and solar, are needed. We have solar panels on our roof and generate 125% the electrical energy we use, so I'm not just being a NIMBY. However, these projects need to be placed with sensitivity to their surrounding natural and cultural resources. The Imperial Valley is full of agricultural fields, some of them fallow or abandoned; why cannot this project be located in such an area? **P246-06**

I ask that you extend the public comment period by at least 30 days, and hold more public meetings to give greater opportunity for verbal comments. Most importantly, the BLM needs to **P246-07** adopt the "no project" alternative. There is simply no good reason to despoil our desert wildlands in this thoughtless fashion. **P246-07, cont.**

Yours truly,

Callie Mack
8529 Jackie Drive
San Diego, CA 92119
619-698-9512

HARRISON KARR
44 Blossom Drive
San Rafael, California 94901

RECEIVED
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CALIF. DESERT DISTRICT
MORENO VALLEY CA

October 6, 2011

Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Re: Proposed Ocotillo Wind Energy Facility
Ocotillo, CA

Dear Mr. Perry:

P247-01

I am writing to express my strong opposition to the proposed Ocotillo Wind Energy Facility near the Anza-Borrego Desert State Park. The failings of wind energy (inefficiency, bird kills, etc.) have been well-documented elsewhere. In this letter I choose to emphasize my personal observations.

I spent my childhood in the desert near Palm Springs and Indio, California. I deeply love the desert and I know the fragility and subtle beauty of the desert landscape, and the breadth and longevity of the human impacts on it.

I first saw the San Gorgonio Pass Wind Farm near White Water, California, as an adult driving into the Coachella Valley. I was horrified at the destruction wrought by the bulldozers and construction crews as they erected the wind towers. Decades later, the scars remain, and they are unlikely to be erased for centuries more. And those visible impacts are dwarfed by the less-visible impacts that project had on the plant and animal life in that area.

When I heard that another large wind project is proposed adjacent to the Anza Borrego Desert State Park, one of my favorite desert parks, I was appalled.

P247-02

In reviewing the EIS, I see that this proposed project may have significant impacts on Peninsular Bighorn Sheep and Flat-tailed Horned Lizards, significant direct and indirect impacts to nesting bird species, and degradation to habitat for several species, including golden eagles and burrowing owls. The desert is very slow to recover from human disturbance, and we have an obligation to preserve what is left. Even with the potential mitigation efforts, I consider these impacts to be completely unacceptable.

P247-03

I am an environmental attorney and an avid birder, and I consider myself to be a strong environmentalist. I support alternative energy when it can be provided in an environmentally sensitive, sustainable manner. In my view, the proposed Ocotillo Wind Energy Facility does not meet those standards.

I strongly urge the BLM to deny this proposed project, and to determine that the right of way is unavailable to future wind energy generation projects.

Sincerely,

Harrison Karr

From: aschoeck@roadrunner.com [mailto:aschoeck@roadrunner.com]
Sent: Wednesday, October 05, 2011 12:18 PM
To: Perry, Cedric C
Subject: Comment DEIS/EIR Ocotillo Wind Energy Facility

Attached are my comments to the DEIS/EIR Ocotillo Wind Energy Facility

I wish to notified of the receipt of this email. In addition, I wish to be notified when the FEIS/EIR Ocotillo Wind Energy Facility is available.

My mailing address is:

Arnold F. Schoeck
PO Box 3881
El Centro, CA 92244-3881

My phone number is: 760-337-8753

Thank you for your assistance.

Comments of

The Draft EIS/EIR Ocotillo Wind Energy Facility

By

Arnold F. Schoeck

10/04/2011

I will concentrate my comments on the recreation aspects of the Draft EIS/EIR. The recreation sections did not include any data on actual recreational use of the area. The Recreation Information Management System (RMIS) should be able to provide visitation statistics for the project area, the Coyote Mountains Wilderness, and the Jacumba Mountain Wilderness. That data could have been enhanced with observations of rangers and other field staff. Since the applicant first applied for the project, time existed to gather supplemental information on visitation such as the addition of traffic counters at major access points to the project area, the Coyote Mountains Wilderness, and the Jacumba Mountain Wilderness. Highway traffic counts were made in December for the DES/EIR. It is also possible that the US Border Patrol would be a source of information. For example, by how much does traffic through the Highway S-2 checkpoint increase during flowering season. **P248-01**

The discussion of the recreational use and activities is so vague as to be misleading. In the impacts of the project upon recreation use, a false assumption appears to be made that all recreation uses are the same and can be easily substituted with another area that has dispersed recreation. A Recreation Opportunity Spectrum (ROS) type of analysis would have revealed that hiking to the wind caves in the Coyote Mountain Wilderness is a unique experience. The wind caves are larger and more numerous than the ones found near Split Mountain in Anza-Borrego Desert State Park (ABDSP). I believe these are the only two sets of wind caves where a visitor can walk into and eat lunch for several hundred miles. The Yuha ACEC and Plaster City Open area are nearby and have their own unique recreation resources, but they are not substitutes for hiking to the wind caves. **P248-02**

Another example of dispersed recreation that cannot be easily duplicated in the area is hiking up a slot canyon or exploring Davies Canyon in the Jacumba Mountains Wilderness. In the Coyote Mountain Wilderness, each canyon and its wash provide differences in geology, plants, and visual sights. Canyons that are next to each other such, as Fossil Canyon and Ocotillo Canyon, are vastly different and have their own unique character. The uniqueness is not duplicated in other nearby BLM or ABDSP wilderness areas. The solitude, absence of vehicles and lzck of associated noise will not be found in the nearby Plaster City Open Area nor in the Yuha ACEC. **P248-03**

Off-Highway Vehicle (OHV) users are incorrectly lumped together in the analysis of impacts. Driving in the Imperial Sand Dunes and camping with thousands of people in large groups is enjlyed by some OHV users. But othesr prefer quieter and less congested driving on such as in the Yuha ACEC and the Plaster City Open Area. Driving in sand does not provide these users with the same degree of satisfaction as driving on flat areas with rolling hills and washes and occasionally technically challenging routes but still **P248-04** having open vistas as they drive and camp. Other OHV users prefer more mountainous and challenging areas to drive and camp with only a couple of vehicles. The screening by the terrain and spur routes up side canyons provide them with the greatest degree of satisfaction. There are other subgroups of OHV users. Some users prefer to mix their type of OHV experience over a year or change as the seasons change. **P248-04, cont.**

The recreation sections of the DEIS does not say how long routes of travel in the project area would be closed. Instead one is referred to the construction section where the closure of the project area to recreation use is estimated to be from 2 to 2.5 years for the construction of Phase I and Phase II. Depending on timing that would mean use would be closed for 2 to 3 seasons. There is no discussion of the impacts, by route of travel, such a closure would be. Access to several trailheads and parking areas for the south side of the Coyote Mountains Wilderness would be blocked. For example the route of travel to the wilderness boundary and trail to the wind caves would be closed. Based upon map 3.13.1 access to Fossil Canyon would be closed since the Imperial County's Shell Canyon Road ends approximately at the entrance to the Ocotillo sanitary landfill. The remaining distance to Fossil Canyon is on an approved route of travel to the wilderness boundary. **P248-05**

Access to the Jacumba Mountain Wilderness along Hwy 98 would be restricted primarily to Coyote No 2. Route T670023 may be open but the map indicates part of it would be within the project area and therefore subject to closure for 2 to 2.5 years. The western most routes along Highway 98 would be closed and block access to several trailheads and parking areas at the wilderness boundary. Overnight camping is allowed at the trailhead and parking area at the end of the westernmost route (T670162) because it is outside of the Yuha ACEC. **P248-06**

The map shows part of the Dos Cabezas Road as being within the project area. The road provides access to the adjacent ABDSP and BLM lands west of Hwy S-2. It also allows OHV users to drive one of several loop trips that includes both BLM and ABDSP approved routes of travel. As a side note, the DEIS/EIR does not discuss Dos Cabezas Road or Shell Canyon Road even though they are Imperial County roads that might be closed by the project . Are there other roads on the Imperial County Transportation Plan that are within the project area and were not discusses? Procedures for closing and or abandoning a county road are not discussed in the Recreation or Transportation section. **P248-07**

One has to search through the DEIS/EIR to find that during the decommissioning, the 15,000 acre (23.44 square miles), of the project area will again be closed for an estimated 25 weeks which translates into another season where the project area would be closed and access to the Coyote Mountains Wilderness and the Jacumba Mountains wilderness would be restricted.

Such long closures to unique recreation experiences should be considered as a significant impact to recreation use of the project area and the adjacent wilderness areas. The wind caves in the Coyote Mountain Wilderness are frequently visited by groups such as the Boy Scout and Girl Scouts. San Diego County residents and others use several guidebooks such as The Anza Borrego Desert Region by Lindsay and Afoot and Afield: San Diego County by Schad to visit described trails and features in the area. These impacts could be mitigated by closing the routes on weekdays. Routes that are the primary **P248-08** means of access to the Jacumba Mountains Wilderness and the Coyote Mountain Wilderness could be open from Friday night to Monday morning. Locked gates could be installed to enforce the limited opening of the routes. If a Limited Route designation is needed, it could be included in the CDCA Plan Amendment if the project is approved. Another mitigation would be to construct along these access routes during the off-season of June to September. Other forms of mitigation should be possible that would allow construction to occur and also allow recreation access to continue.

P248-08, cont.

There is no discussion of the California Desert Conservation Area's (CDCA) transportation plan that includes roads, routes of travel and trails as a source of information. The actual number of routes closed and the mileage should have been provided for each alternative.

P248-09

The DEIS/EIR is inconsistent in using the names for the wilderness areas in the project area. The Act of Congress that designated the wilderness areas also named them the Jacumba Mountains Wilderness and the Coyote Mountains Wilderness. The word "Area" was not part of the titles. Therefore, the FEIS/EIR should use the names established by Congress.

P248-10

"Fossil Canyon, also known as Shell Canyon, is located in Anza-Borrego Wilderness to the west of the proposed OWEF site..." (p. 3.15-2, paragraph 2). Fossil Canyon is actually located in the Coyote Mountains Wilderness and is near the northeast corner of the project area. The canyon is also known as Alverson Canyon (Geology of San Diego County: Legacy of the Land).

P248-11

The Visual Resources section would be improved by adding a Key Observation Post from an elevated point in the Coyote Mountain Wilderness. That would have ptovided a more complete discussion of the foreground and middle ground visual impact of the roads to be constructed and maintained by the project.

P248-12

The index includes Off-Highway Vehicles but there is no listing for recreation or non-motorized recreation.

P248-13

The discussion of roads for the project appears to be inconsistent and/or illogical. Permanent 20-foot wide roads would be constructed for the project and they would be expanded to 36-foot wide roads during construction to provide access for a crane. The temporary 16-foot width would be rehabilitated. But "The crane pads will remain in place following construction for potential future maintenance at the tower." (p. 2-8) If the crane is expected to be used for maintenance, the width of the road would have to be increased to a 36-foot width each time the crane is use. This point needs to be clarified or elaborated in the FEIS/EIR.

P248-14

A discussion is needed regarding the rehabilitation of the expected 3 15 acre material sites for the project.

P248-15

At the time of decommissioning, only underground cables and structures will be removed from a depth of 3 feet. The underground cable circuits are to be buried at a depth of 4 feet and therefore would not be removed. Leaving the cable circuits in place under washes could become a safety hazard or a nuisance. Infrequent storms, 10+ years, have had enough force to scour deposits to depths greater than

P248-16

10 feet. The cables would then be exposed. This potential hazard/nuisance could be resolved by cutting the cable circuits at the edges of each wash and then removing the section of cable under the wash. **P248-16, cont.**

The Draft EIS/EIR for the Ocotillo Wind Energy facility did not include a legal description (Township, Range, Section, subsections). The sections were also not shown on the figures. This made it difficult to locate the proposed action and alternative and their impacts. This was particularly true for analyzing the impacts of a 2 to 2.5 year closure of routes during construction of Phase I and Phase II. During decommissioning the area and routes of travel would be closed for another 25 weeks. **P248-17**

From: Julian Hurt [mailto:julian.hurt@gmail.com]
Sent: Wednesday, October 05, 2011 1:18 PM
To: info@theabf.org; raycastillo@co.imperial.ca.us; garywyatt@co.imperial.ca.us; michaelkelley@co.imperial.ca.us; jackterrazas@co.imperial.ca.us; johnrenison@co.imperial.ca.us; angelinahavens@co.imperial.ca.us; Perry, Cedric C
Subject: Re: Can you help submit Ocotillo Wind comments by Thursday?

To Whom it May Concern:

RE: Ocoillo Express Wind Project

For many years I have visited the Anza -Borrego Desert and surrounding area. This is one of the most starkly beautiful areas that I have ever seen. It would be a shame to have this area devastated by the proposed energy project.

Several species of animals are endangered by this, there would be significant impact on tourism in the area and it simply would be an eyesore in a beautiful, grand landscape. I would like to express by complete opposition to this proposal. Further public comment needs to be heard.

Certainly other alternatives for nonoil based energy production could be adopted rather than destroy habitat, obstruct a grand view and lead to the potential for overdevelopment in the surrounding area.

P249-01

Sincerely,

Julian E.. Hurt, M.D.

On Mon, Oct 3, 2011 at 7:58 PM, <info@theabf.org> wrote:

October 3, 2011

Dear Julian and Myra

ABF would like to thank those of you who have already sent letters of opposition on The Ocotillo Express Wind Project.

If you have not already, ABF urges you to speak out before the Thursday, October 6 deadline against the destructive wind power development slated near Anza-Borrego Desert State Park's southeastern border near Ocotillo. Just 30 minutes could protect 12,000 acres of pristine desert habitat.

The Ocotillo Express Wind Project is now undergoing environmental review by Imperial County and the BLM. It is very important that you send your comments to the Imperial County Planning Department as well as to the BLM because Imperial County will make the final decision on whether or not to issue a permit for this project. You'll find all contact information below.

The project is adjacent to Anza-Borrego Desert State Park, California's largest state park, designated as part of the world biosphere reserve. This is a gigantic, ill-conceived project in an irreplaceable desert habitat. We need you to make your voice heard in opposition. View the project EIS here.

Your comment letter, however brief, will add to the record of opposition to this project. A list of topics you can include is below. It's best if you personalize your comment and most importantly, be sure to include your description of what the area means to you, whether you've lived there, visited many times, or never visited at all but value knowing it's there.

P249-02

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov

Email copies to Angelina Havens at the Imperial County Planning Department angelinahavens@co.imperial.caus, and the Imperial County Board of Supervisors:

John Renison
District 1 Supervisor
Email: johnrenison@co.imperial.ca.us

Jack Terrazas
District 2 Supervisor (DISTRICT INCLUDES OCOTILLO)
E-mail: jackterrazas@co.imperial.ca.us

Michael W. Kelley
District 3 Supervisor
E-mail: michaelkelley@co.imperial.ca.us

Gary Wyatt

District 4 Supervisor
E-mail: garywyatt@co.imperial.ca.us

Ray Castillo
District 5 Supervisor
Email: raycastillo@co.imperial.ca.us

You can also fax a copy to the state Clearinghouse at (916) 323-3018, and it would be very helpful if you'd email ABF a copy as well, to Conrad Kramer at conrad@theabf.org.

POINTS TO INCLUDE IN YOUR COMMENT LETTER

The project would:
- Devastate vital habitat for the Endangered Peninsular bighorn sheep, and the flat-tailed horned lizard — a perennial candidate for listing under the Endangered Species Act.
- Add significantly to the cumulative impact on the above species from other energy and agricultural projects in the area.
- Pose a serious threat of injury and death to golden eagles and other raptors known to live in the area, as well as the LeConte's thrasher, burrowing owls, several other sensitive birds species, and as many as twelve species of bats.
- Forever alter the wild character of the southern parts of Anza-Borrego Desert State Park, destroying its recreational qualities.
- Desecrate ancient Native cultural sites in the the Yuha Desert cultural area, and interfere with the work of the soon-to-be-opened Imperial County Desert Museum.
- Turn the town of Ocotillo from a quiet, bucolic desert refuge to an industrial zone full of deafening noise 24 hours a day.
- Illegally alter the landscape surrounding the protected Juan Bautista de Anza National Historic Trail.
- Devastate those parts of Imperial County's economy that depend on tourism in the unspoiled desert

P249-02, cont.

The Draft EIR/EIS is deficient because:
- It does not include a "Distributed Generation" alternative
- Public comment was shortchanged due to a truncated "scoping" process

Urge THE BLM to:
- Adopt the "no project" alternative
- Extend the public comment period by at least 30 days
- Hold additional public scoping meetings at which public statements would be allowed.

Thank you for speaking out in defense of your deserts.

Sincerely,

Chuck Bennett, President
Ralph Singer, Vice-President Environmental Affairs
Diana Lindsay, Trustee
ANZA-BORREGO FOUNDATION
P.O. Box 2001
Borrego Springs, CA 92004
760-767-0446

info@theabf.org
www.theabf.org

About Anza-Borrego Foundation
Founded in 1967, Anza-Borrego Foundation is a nonprofit educational organization, land conservancy, and the sole cooperating association of Anza-Borrego Desert State Park®. ABF's mission is to protect and preserve the natural landscapes, wildlife habitat, and cultural heritage of Anza-Borrego Desert State Park® for the benefit and enjoyment of present and future generations. Anza-Borrego Foundation's Institute provides classes to more than 3,000 adults and children each year, covering topics such as botany, astronomy, photography, paleontology, native cultures, desert wildlife, and more. Visit www.theabf.org to learn more.

P249-02, cont.

Click here if you do not want to receive further emails.

From: robertmbrock@aol.com [mailto:robertmbrock@aol.com]
Sent: Thursday, October 06, 2011 4:47 PM
Cc: robertmbrock@aol.com
Subject: Support for Pattern Energy

To whom it may concern:

I would like to express my personal support for Pattern Energy's Ocotillo Wind Energy Project in the Imperial Valley. P250-01

Please feel free to contact me if you need further explanation and/or written support on official correspondence/forms.

Thank you.

Sincerely,

Robert M. Brock (Bobby)
774 Desert Gardens Dr.
El Centro, CA 92243
(760) 595-5572 Cell

Comment Letter P251

From: Kay Schroer
To: Angelina Havens
Subject: Wind Project
Date: Tuesday, October 04, 2011 6:38:30 PM

I would respectfully request that such a large generation project should be sited as far away from Anza Borega as possible. Anza Borega is a wonderful place that must be preserved for future generations. **P251-01**

Thank you,
Kay Schroer

From: diahna garcia
To: Angelina Havens
Subject: Wind energy project
Date: Thursday, October 06, 2011 9:44:50 AM

Good Morning,
I would like to submit my letter of support for the Ocotillo Wind Energy Project. I attended the informational meeting held at El Centro City Council Chambers, and found the project would be beneficial to the whole Imperial County. I hope that this project will get approvals from all required entities, and will move forward. **P252-01**
Thank You for Your Time,
Diahna Garcia-Ruiz

From: Kristina Rood [kris.rood@yahoo.com]
Sent: Tuesday, October 04, 2011 12:40 PM
To: Angelina Havens
Subject: Ocotillo Wind project: Vote NO

Please vote no on the permit to build the Ocotillo Wind project. As a resident of Borrego Springs, I believe that this construction would seriously impact our peaceful desert lifestyle, as well as disturb wildlife.

I urge you to consider the delicate desert balance for the desert environment, and for we residents who have chosen to make this peaceful community our homes.

P253-01

Thank you,

Kristina Rood

From: Monica [monicaketchum@yahoo.com]
Sent: Wednesday, October 05, 2011 12:42 PM
To: Angelina Havens
Subject: Ocotillo Wind Project

I would like to express my support for Pattern Energy's Ocotillo Wind Energy Project. After reviewing the project infomation, I believe that it will benefit the region, including the creation of jobs, both in the short- and long-term. **P254-01**

Sincerely,
Monica Ketchum
President, Calexico Chamber of Commerce

Monica Ketchum Insurance Services
"Your healthcare is my priority"
PO Box 676
El Centro, CA 92244
Tel: 760-897-4900
Fax: 760-897-2106

From: Rolando Vizcarra [rolandovizcarra@gmail.com]
Sent: Wednesday, October 05, 2011 1:06 PM
To: caocotillo@blm.gov; Angelina Havens
Subject: Ocotillo Wind Project

Angelina,

I just wanted to comment on the Ocotillo Wind Project, as a resident of the Imperial Valley that I DO support the the project!. Thanks

P255-01

--
Rolando Vizcarra
760-595-0206

From: Sylvia Salazar
To: Angelina Havens
Subject: Ocotillo Wind
Date: Wednesday, October 05, 2011 1:19:58 PM

I support this project- we need more jobs, to much unemployment here. **P256-01**

Sylvia Gonzalez

Comment Letter P257

From: Marjorie Seybold [marjorie.seybold@gmail.com]
Sent: Tuesday, October 04, 2011 9:58 AM
To: Angelina Havens
Subject: opposed to Ocotillo Wind Project

Dear Ms Havens,
I would like to express my opposition to the Ocotillo Wind project. As a frequent visitor to that part of Anza Borrego Park, I am fearful that it would disrupt and destry one of the most beautiful parts of the park and forever cost us the animals and birds that live in that region. It is too valuable an area to lose and it would be forever lost if the project goes ahead. Please turn the Project down. **P257-01**

Marjorie E. Seybold
La Jolla, CA

Comment Letter P258

From: Nava, V (Victor)
To: Angelina Havens
Subject: Pattern Energy
Date: Thursday, October 06, 2011 11:44:17 AM

Hello Angelina,

I wanted to express my support and endorsement of the Pattern Energy project. They have already have awarded sponsorships and donations to local organizations and a local school without them being up and running. This shows they are serious about investing in our community. **P258-01**

Best,

Victor Nava

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From: Aaron Popejoy
To: Angelina Havens
Subject: Support for Ocotillo Wind Project
Date: Wednesday, October 05, 2011 11:35:57 AM

Dear Angelina Havens,

On behalf of myself and my entire family, I would like to express my full support for the Ocotillo Wind Project. I am a fourth generation native of the Imperial Valley with a family legacy of commitment to community and improving commerce in this region. Since 1909 we have supported the growth and development of industry in the Imperial Valley. Standing behind agriculture while helping to diversify our local economy for long-term stability. The promise of a robust renewable energy sector is both exciting and urgent. If we are to lead the nation's quest for energy self reliance, someone must take the burden of housing these projects. The resources we have here are extensive and should be used for the greater good. Someone needs to say yes, and that should be the Imperial Valley. For our families, for our businesses, for our neighbors, and for our future. Thank you for your consideration. We really need this to happen. P259-01

Sincerely,

--
Aaron F. Popejoy
--
Creative Director/Operations Manager,
Conveyor Group
--
Immediate Past President, El Centro Chamber of Commerce & Visitors Bureau
Immediate Past Chairman, Imperial Valley Joint Chambers of Commerce
Director, Imperial Valley Community Foundation
Director, Imperial Valley Arts In Motion
Past President, Rotary Club of El Centro, CA
Appointee, Imperial County OEDC
Advisor, I.V. Regional Occupational Program
Advisor, Imperial Valley College CIS Program
Member, Imperial Valley Independent Business Alliance
Member, American Institute of Graphic Arts
--
aaron@conveyorgroup.com
--
Phone: 760-355-1500
Fax: 760-355-8855
--
2419 Imperial Business Park Drive
Imperial, CA 92251
--
www.conveyorgroup.com
--
Move Up In The World...
Call Conveyor Group Today!

From: mgrindley [wahookil@cox.net]
Sent: Tuesday, October 04, 2011 5:09 AM
To: Angelina Havens
Subject: thoughts on wind project

Dear Sirs,

Once again I find myself urging myself to speak up when something is not quite right,,,,,,,,,,,,,,,perhaps with this many people protesting a given project, you all should ask youself if maybe the present plan for the wind power development near the state parki s right.

This is an enviromental review and I as a concerned person and beneficiary of the beauty and a beleiver in the reserve for all the animals of this habitat encourage you to make the right choices here. The enviroment will be here long after the needs of a few.

I am sure you have many options, please choose to use them.

P260-01

Thank you,
Mark Grindley

Comment Letter P261

From: Estrada-Mcwane, Rebecca [rebecca.estrada-mcwane@twcable.com]
Sent: Wednesday, October 05, 2011 11:13 AM
To: Angelina Havens
Subject: Ocotillo Wind Energy Project

Importance: High

I say.....YES I support the Ocotillo Wind Project....a natural corridor for our natural resources...wind is natural energy!!! I believe in this project! **P261-01**

Thank you,
Becky Estrada-McWane
Senior Account Executive
Time Warner Media
CELL#760-604-6073
OFFICE#760-353-8776

This E-mail and any of its attachments may contain Time Warner Cable proprietary information, which is privileged, confidential, or subject to copyright belonging to Time Warner Cable. This E-mail is intended solely for the use of the individual or entity to which it is addressed. If you are not the intended recipient of this E-mail, you are hereby notified that any dissemination, distribution, copying, or action taken in relation to the contents of and attachments to this E-mail is strictly prohibited and may be unlawful. If you have received this E-mail in error, please notify the sender immediately and permanently delete the original and any copy of this E-mail and any printout.

From: georgeanava@gmail.com on behalf of George A. Nava [GNava@brawley-ca.gov]
Sent: Wednesday, October 05, 2011 11:51 AM
To: Angelina Havens; caocotillo@blm.gov
Subject: Ocotillo Wind Energy Project - Public Comment

Please include this message in your public comments. I fully support the Ocotillo Wind Energy Project. **P262-01**

Kind Regards,

George A. Nava
Brawley Resident and Member of the Brawley City Council

From: Myrna
To: Angelina Havens
Subject: Ocotillo Express Wind Project
Date: Tuesday, October 04, 2011 4:56:03 PM

Dear Ms. Havens,

I have a home adjacent to the Anza Borrego Desert and always enjoy the descent down Highway 8 into quiet little Ocotillo. Hard to imagine the constant noise and traffic that will destroy the peacefulness of this tiny community.

I wonder how much pressure the so called Sunrise Powerlink a.k.a. Sempra Energy is exerting on decision makers in a desperate attempt to justify their ill conceived, destructive, "let the rate payer pay" project.

Please, please do not further desecrate our beautiful desert, causing, of course, destruction of the habitat of so many birds and animals.

Thank you for your consideration.

Sincerely,

Myrna Wosk
185 Canyon Road
Julian, CA 92036

P263-01

October 4, 2011

Cedric Perry, Project Manager
Bureau of Land Management
Ocotillo Wind Express Project
22835 Calle San Juan Los Lagos,
Moreno Valley, California 92553
cperry@blm.gov

Subject: DEIS Comments for Ocotillo Wind Express

Dear Mr. Perry,

Please accept the following comments on the proposed Ocotillo Express Wind Energy Project Draft Environmental Impact Statement (DEIS) CASE FILE NUMBER: CACA051552 DOCUMENT NUMBER: CA-670-2010-032.

Basin and Range Watch is a group of volunteers who live in the deserts of Nevada and California, working to stop the destruction of our desert homeland. Industrial renewable energy companies are seeking to develop millions of acres of unspoiled habitat in our region. Our goal is to identify the problems of energy sprawl and find solutions that will preserve our natural ecosystems and open spaces. We have visited the Ocotillo Wind Express Project site and are concerned about the direct and cumulative impacts that the project would have on the region.

Comment Deadline/Priority Projects and Unresolved Public Meeting Issues:

The public meetings held for this project were not satisfactory. Some people traveled for up to two hours and were not permitted to make public comments. This created conflicts for many people. BLM received complaint letters over this. BLM did not respond to requests to hold additional meetings. There were other requests to extend the public comment deadline over this. Spoken comments can be the preferred method for some members of the public to submit comments to the BLM. People with disabilities may actually prefer a spoken comment over a written comment. It is the BLM's responsibility to make these different formats available to the public.

There are 64 maps in Appendix A which are posted on line, but are extremely difficult to download due to the immense size of the files. BLM has made it very difficult to review this document.

P264-01

Purpose and Need:

The Purpose and Need Statements in many BLM big wind EIS documents reflect a need to develop so many megawatts on so many acres of public lands. All alternatives are now defined by a Need reflecting the recent Secretarial Order 3283: Enhancing Renewable Energy Development on Public Lands.

The goals of Section 4 in Secretarial Order 3283 clearly state a need for environmental responsibility: *"the permitting of* ***environmentally responsible*** *wind, solar, biomass, and geothermal operations and electrical transmission facilities on the public lands;*

The Ocotillo Wind Express Project in its proposed location would be inconsistent with the Best Management Practices concerning the National Environmental Policy Act, the Endangered Species Act, and the Federal Lands Management Policy Act, etc and can, in no way, be considered "environmentally responsible".

P264-02

The BLM's Purpose and Need statement in the DEIS quotes FLPMA (section 10 (c)) and claims that *"public lands are to be managed for multiple use that takes into account the long term needs of future generations for renewable and non-renewable resources."* The Ocotillo Wind Express site would take up 23 square miles. Public land access would be extremely limited and other land use would be impaired. It would be impossible to manage these lands for multiple use when so much of the land is sacrificed for just one use. Mandates to use renewable energy can be compensated in the distributed generation alternative we have provided in these comments. If a large project impairs the BLM's mandate to manage these lands under a multiple use philosophy, the BLM should provide a sound, environmentally friendly alternative.

We would like to request that the Purpose and Need statement be rewritten to include mandates to protect sensitive biological, hydrological, cultural and visual resources. We would also like the statement to include a mandate to protect property values, maintain access to public lands as well as preserve Class L lands designated in the California Desert Conservation Area.

Alternatives:

A full range of alternatives should be considered in every EIS document. That is required by NEPA. This seems to be one of the biggest problems with most of them.

P264-03

Following the guidelines of the National Environmental Policy Act, the final EIS should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision maker and the public. In this section agencies shall:

(a) Rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated.

(b) Devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits.

(c) **Include reasonable alternatives not within the jurisdiction of the lead agency.**

(d) Include the alternative of no action.

(e) Identify the agency's preferred alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference.

(f) Include appropriate mitigation measures not already included in the proposed action or alternatives.

The DEIS provides 6 alternatives, the best being Number 5 which denies the ROW grant and approves a land use plan excluding wind energy from the land use plan.

We would like to request that the BLM consider the following alternatives for the Ocotillo Wind Express Project:

P264-03, cont.

1. **No Action which designates a conservation status to the area:** This would be more than just an exclusion of wind energy. This alternative would recognize wildlife habitat and cultural values as resources with high conservation value.
2. **Private Land Alternative outside of Imperial Valley:** Under NEPA, the BLM is required to consider off site alternatives. The weak Purpose and Need statement in the DEIS fails to acknowledge opportunities the BLM could take to site this project on lands with lower conservation value. The California Desert Protection Act Class L designations of the lands on the site should be reason enough to find a better site for this project.

   The US Environmental Protection Agency has identified over one million acres of degraded lands or "brown-fields" in the United States that would be appropriate for large scale renewable energy development.

   Furthermore, the BLM should identify private lands located OUTSIDE of Imperial Valley to site this project. Imperial Valley has some of the most endangered desert habitat in California. It is facing cumulative development threats including several large renewable projects that are attempting to connect to the Sunrise Powerlink. There are degraded lands in the Central Valley, California that this company could develop wind or solar energy on. P264-03, cont.

3. Distributed Generation:

Distributed generation in the built environment should be given much more full analysis, as it is a completely viable alternative. This project will need just as much dispatchable baseload behind it, and also does not have storage. But environmental costs are negligible with distributed generation, compared with this project. Distributed generation cannot be "done overnight," but neither can large transmission lines across hundreds of miles from remote central station plants to load centers. Most importantly, distributed generation will not reduce the natural carbon-storing ability of healthy desert ecosystems, will not disturb biological soil crusts, and will not degrade and fragment habitats of protected, sensitive, and rare species.

Alternatives should be looked at that are in load centers, not closest to the project site. There is a need to consider the "macro" picture, the entire state, to look at maximum efficiency.

A master comprehensive plan should exist before large expensive inefficient solar plants are sited and built out in the wildlands. This plan should carefully analyze the recreational and biodiversity resources of the Mojave Desert. A list of assumptions should be included detailing the plan for integrating various fuels mixes and technologies into each utility's plan, an overall state plan, and a national plan. Loads should be carefully analyzed to determine whether additional capacity is needed for peaking, intermediate, or baseload purposes. Unit size, which impacts capital and operating costs and unit capacity factors, has a direct bearing on the relative economics of one technology over another. A plan might recommend that smaller units built in cities and spaced in time offer a less risky solution than one large unit built immediately. P264-04

Right now there is no utility plan, no state plan, and no national plan. Large-scale central station energy projects have been sited very far from load centers out in remote deserts, with the only criterion being nearness to existing transmission lines and natural gas lines. Very little thought has been given to the richness of biological resources, the cumulative impacts on visual scenery to tourists, the proximity to ratepayers, or the level of disturbance of the site.

The California Energy Commission says they will be a need to build many new efficient natural gas peaker or baseload plants to back up the renewable projects planned. Instead, the renewables should be distributed generation in load centers, which will provide much more efficiency, rather than inefficient remote central station plants that reduce biodiversity and require expensive transmission lines. This reduces the risk, as distributed generation is a known technology and has been proven in countries like Germany where incentive programs have been tested. Incentive programs can be

P264-04, cont.

designed in an intelligent manner to vastly increase distributed generation. Incentives for large remote projects are unproven to lower risk and may actually raise debt levels with runaway costs associated with poor sighting and higher-than-anticipated operating and maintenance costs.

Many renewable project developers have failed to consider reasonable or viable alternatives that could serve as solutions that everybody could live with. In the case of this particular project, conflicts with endangered species, cultural resources, storm water drainage erosion, viewscapes from National Parks and wilderness areas could all be avoided with a distributed generation alternative.

Affected Environment/Environmental Consequences:

Air Quality/Climate Change:

P264-05

Recent upgrades and development located on the Creech Air Force Base in Indian Springs, Nevada have resulted in very poor air quality for the region and those living there. Inversion effects cause airborne dust to linger for hours. Even the mitigation using water trucks has not been able to control the fugitive dust from this construction.

Valley Fever is a public health threat and is a common issue that impacts desert communities when dust is stirred up. The amount of time required to build this project will cause construction to kick up dust every day for the next couple of years. A project of such massive size has the potential to threaten public health by putting people at risk for exposure to valley fever.

Removal of stabilized soils and biological soil crust creates a destructive cycle of airborne particulates and erosion. As more stabilized soils are removed, blowing particulates from recently eroded areas act as abrasive catalysts that erode the remaining crusts thus resulting in more airborne particulates.

Cumulative impacts on air quality will result from the removal so much stabilized soil and biological soil crust.

Greenhouse Gases and Climate Change:

P264-06

Transmission line upgrades and new transmission facilities will increase the use of the green house gas called SF6 is used primarily in electricity transmission - and is emitted in especially large amounts in construction of new lines – and is 24,000 times as potent as CO2 in its global warming impacts. The Environmental Protection Agency has declared "that the electric power industry uses roughly 80% of all SF6 produced worldwide". Ideally, none of this gas would be emitted into the atmosphere. In reality significant leaks occur from aging equipment, and gas losses occur during equipment maintenance and servicing. With a global warming potential 23,900 times greater than CO2 and an atmospheric life of 3,200, one pound of SF6 has the same global warming impact of 11 tons of CO2. In 2002, U.S. SF6 emissions from the electric power industry were estimated to be 14.9 Tg CO2 Eq. ...

http://www.epa.gov/electricpower-sf6/basic.html

P264-06, cont.

Will commuters be driving gas powered vehicles to and from work in a rural area for the next 30 years or however long the lifespan of the project is? How much green house gas is this? Construction is taking place for the the Ivanpah Solar Electric Generating System in San Bernardino County, California. At starting time and quitting time over 200 cars commute to and from work from distances up to 200 miles round trip.

Carbon Sequestration and removal of plants, caliche layers and biological soil crust would all be removed for this project. Scientists are recommending that the offset of C02 emissions be studied. Will the new energy plant actually offset greenhouse gases? Will the amount of C02 offset from wind energy compensate for the removed caliche formations and organic matter?

Natural Gas Backup:

P264-07

Wind power is not emission free. Grids that have less hydro-electric power require adding natural gas plants and are therefore not emission free. The main challenge of grid operation is to supply enough capacity to meet the peak load, rather than to save fuel. Windmills do not help overcome this challenge. It doesn't matter how many windmills are built. This does not help if the wind is not blowing. The hope that wind-generated power will always be able to meet the peak from some far away wind farm is not reasonable because of transmission losses.

Water Resources:

P264-08

The DEIS seems uncertain about the availability of groundwater resources or even if the construction phase of the project would actually draw down the aquifer. The site is located in the Colorado River Hydrologic Region which is a very sensitive and protected resource. The project construction phase would use about 100 acre feet, 50 going to dust control. The well would be on private land. Since water resources are not adjudicated, all property owners above a common aquifer possess a shared right to reasonable use of the aquifer. The Ocotillo Wind Express Project could draw down already over-drafted basins including the strapped Coyote Wells Groundwater Basin. Other basins are described as "unknown" in the DEIS.

The only mitigation for aquifer drawdown appears to be monitoring. It would be very difficult to order construction of a Priority Project stopped after approval of the ROW.

P264-08, cont.

Altercations of stream channels can adversely impact localized groundwater recharge.

Desert Pavement:

P264-09

Desert pavements are found on alluvial fans and piedmonts below mountains in the Mojave and Sonoran Deserts. Stones over fine sediments may form a weak pavement, in the case of granitic stones at the Imperial Valley Solar Project site which decompose and weather more quickly, or if derived from volcanic or limestone sources, may be densely packed, inter-locking, and resistant. Wind-blown silts and sands collect in between and below the gravel pavement. Varnish usually colors the rock surfaces exposed to air a darker color, and can be useful for aging the pavement. Varnish is the result of surface evaporation of various salts on the rock, building up a crust.

Dr. Boris Poff, former hydrologist at Mojave National Preserve, gave testimony at the Calico Solar Project evidentiary hearing held by the California Energy Commission on August 5, 2010. The rock surface of desert pavements stabilizes fine sediments underneath, and may potentially increase rainwater infiltration. When they are disturbed, desert pavements lose this function and surface run-off increases, as does erosion and downhill sedimentation.

Many desert pavements are extremely old, taking thousands of years to develop. North of the Calico project site in San Bernardino County, a desert pavement has been dated at 7,000 years old. There can be three feet of deep sand under the rocky cap that takes millennia to build up.

Small mining roads through desert pavements have yet to recover from this disturbance.

The National Resource Conservation Service has started a soil mapping program at Mojave National Preserve, and they have found that desert pavements have not been adequately analyzed and categorized. Much of the data is out-dated.

Conversely, other desert pavements may be younger and hide archaeological treasures. At the Calico Solar Project workshop held August 12, 2010, we learned from archaeologist Dr. David Whitley, that one cannot assume that subsurface archaeological materials are absent just because a desert pavement covers the ground. "This is a myth," he told the applicant, Tessera Solar. He explained that recently scientists have learned that some desert pavements can form quickly, and ceramics have been found underneath them.

http://www.energy.ca.gov/sitingcases/calicosolar/documents/2010-08-05_Transcript.pdf

How will the removal of desert pavement affect the flood potential of the region? How will this alter the local hydrology? Will existing groundwater aquifers see less recharge? Will new locations that catch water be created? How will this impact wildlife and populations of phreatophytes that depend on flood water drainage?

P264-09, cont.

Visual Resources:

This project would be built adjacent to outstanding conservation areas and the impact to visual resources will degrade the visitor experience. The project would be placed next to the Yuha Area of Critical Environmental Concern, Anza Borrego State Park, the Coyote Mountains Wilderness Area, the Jacumba Mountains Wilderness Area, and it would be visible from the community of Ocotillo.

The BLM should require more KOP simulations that depict all of the visual impact scenarios. All of the most potentially visible angles of light and time of day should be considered to depict the worst case scenario.

The following BLM required factors to be considered:

(2) Angle of Observation. The apparent size of a project is directly related to the angle between the viewer's line-of-sight and the slope upon which the project is to take place. As this angle nears 90 degrees (vertical and horizontal), the maximum area is viewable.

(3) Length of Time the Project Is In View. If the viewer has only a brief glimpse of the project, the contrast may not be of great concern. If, however, the project is subject to view for along period, as from an overlook, the contrast may be very significant.

P264-10

(4) Relative Size or Scale. The contrast created by the project is directly related to its size and scale as compared to the surroundings in which it is place.

The 13,000 acre size of the project is large and will have the potential to impact different VRM zones of different classes. Much of the public lands in Imperial Valley lands are considered a Class One Visual Resource Management Zone and Anza Borrego State Park has its own standards. BLM defines the objective of this class *"to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention".*

Wind turbines that tower above 450 feet have a three dimensional impact. It is impossible to mitigate these impacts. Protecting visual resources also means protecting unbroken landscapes from very major industrial impacts.

Dark Skies:

Turbines will be illuminated by red flashing lights all night to conform to FAA regulations.

The Tehachapi, California region has been highly impacted by industrial wind energy. On overcast nights, local people who are not even in direct view of the actual wind turbines report that all of the red aviation lights reflect off of the clouds and create visual impacts at even great distances from the turbines.

The KOP simulations from Anza Borrego State Park are actually well done and they clearly show that these impacts simply can not be mitigated. But the KOP's are incomplete.

We would like to request that the following Key Observation Point simulations be included in the FIES: P264-11

- At least two KOP simulations from different elevations should be provided from the Jacumba Mountains Wilderness Area
- At least one KOP simulation from the Yuha Area of Critical Environmental Concern
- At least two KOP simulations from different elevations from the Coyote Mountains Wilderness Area
- At least two more KOP simulations from the community of Ocotillo
- At least four dark sky KOP simulations depicting red flashing aviation lights from Anza Borrego State Park, The Jacumba Mountains Wilderness Area, The Coyote Mountains Wilderness Area and the community of Ocotillo.

Socio Economics/Environmental Justice and Private Property:

While this project will be promoted as an economic win/win for everybody, nothing could be further from the truth. When you take a look at the labor crews that have been hired to work on recent federally approved solar and wind projects, it becomes obvious in many cases, that the workers are not local residents. This is because the developers make deals with Unions from larger cities. It does not seem to matter if the locals are qualified because the labor deal was made somewhere else.

After about three years of construction, an industrial wind project will only create about 10 to 15 full time jobs. P264-12

Large, subsidized energy projects tend to create a boom and bust effect on small communities.

The DEIS claims that property values would not be impaired based on a theoretical study in regions well away from the project site. All you would really need to do is interview people living near Tehachapi or San Gorginio Pass and ask them how easy it would be to sell their property. Adverse health effects alone would prevent several potential buyers from looking at a property. We are disappointed that the BLM took such a biased position on this issue. The BLM should have consulted a local real estate agent to get more accurate information on property values.

P264-12, cont.

Public Health:

The DEIS admits that residents of the community of Ocotillo would experience noise from the turbines, but you have undermined those impacts as well.

These turbines will be built very close to local residents. Wind turbines located next to local residents have been proven to impact public health.

Wind Turbine Syndrome has been identified by Nina Pierpont, MD, PhD, a pediatrician and author of "Wind Turbine Syndrome: A Report on a Natural Experiment" (2009)
She identifies the following symptoms for Wind Turbine Syndrome:

"(1) Sleep disturbance. Not simply awakened, but awakening in a panic ("flight or fight" response). (2) Headache. (3) Tinnitus. (4) Ear pressure. (5) Dizziness. (6) Vertigo. (7) Nausea. (8) Visual blurring. (9) Tachycardia. (10) Irritability. (11) Problems with concentration and memory. (12) Panic episodes associated with sensations of internal pulsation or quivering, which arise while awake or asleep. (This latter involving other, non-vestibular organs of balance, motion, and position sense.) "

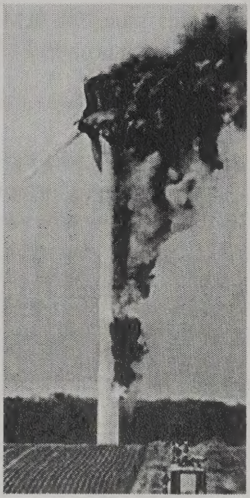
The DEIS fails to recognize the full potential impacts of noise to public health.

P264-13

Hazardous Materials:

Wind turbines are packed with chemical oils and lubricants. Rare Earth minerals are used in components of industrial wind turbines. Turbines also will explode occasionally. How are highly toxic compounds cleaned up after these explosions?

P264-14


Exploding Wind Turbine

Land Use and Recreation:

All of the public lands in the California Desert Conservation Area (CDCA) under BLM management, except for a few small and scattered parcels (approximately 300,000 acres), have been designated geographically into four multiple-use classes. The classification was based on the sensitivity of resources and kinds of uses for each geographic area.

MULTIPLE-USE CLASS L

Multiple-Use Class L (Limited Use) protects sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished.

P264-15

All of the public lands slated for development for this project have been designated Class L lands under the 4 multiple use classifications defined in the California Desert Conservation Area plan. The impacts from this project would be so sever, that the CDCA plan needs to be amended just to approve the project. The Ocotillo Wind Express project would develop over 20 square miles of Class L lands.

Large projects like Ocotillo Wind are also impacting the multiple use philosophy of the BLM. A 23 square mile project will cut of a significant amount of access for public land owners. As populations grow, open space becomes more valuable culturally. Future trends of available public access to public lands relating to population growth and energy sprawl should be considered. The unspoiled character of the site may be even more important to future generations.

P264-15, cont.

Biological Resources:

Biological Soil Crust:

Biological soil crust is found throughout the Ocotillo Wind Express Project site.

Soil biological crust is a mix of organisms that occupy and protect the surface of the soil in most desert ecosystems. The organisms often include filamentous and non-filamentous cyanobacteria, mosses, lichens, liverworts and fungi.

A Field Guide to Biological Soil Crusts of Western U.S. Drylands ;Common Lichens and Bryophytes. Roger Rosentreter, Matthew Bowker, Jayne Belnap

They say the following concerning biological soil crusts:

"Biological Soil Crusts are found on almost all soil types. Green algae are favored on more acidic and less salty soils, whereas cyanobacteria are favored on alkaline soils and soils with high salt content. Within a given climate zone, the cover of lichens and mosses generally increases with higher clay and silt content and lower sand content, as this also increases the stability and water-holding capacity of the soil. However, BSC cover and development is limited on clay soils with a high shrink-swell coefficient. Habitats within a site that are more moist (e.g., under plant canopies and thin plant litter or on north/northeast exposures) generally support a greater cover of lichens and mosses."

P264-16

And:

"Ecological function:

The presence of these organisms on the soil surface increases soil stability. Because they are photosynthetic they also contribute carbon to the underlying soils. Free-living and lichenized cyanobacteria can also convert atmospheric nitrogen into bio-available nitrogen, and thus are an important source of this often limiting nutrient. All these organisms also secrete compounds that increase the bio-availability of phosphorus. Lichen morphological types with a more discontinuous cover (crustose, squamulose) allow water, gases, and seedlings to pass through to the soil surface, whereas mosses and lichens with a more continuous cover (foliose, fruticose) often block the flow of materials to the soil surface."

How would the removal of soil crusts be mitigated?

Plant communities:

Much of the project site has well established plant. Communities include smoke tree, mesquite, creosote scrub, ocotillo scrub, Wolf's cholla scrub and others. The Imperial Valley has seen more development and impacts than most of the California Desert. In tact, old growth plant communities in the Imperial Valley should be preserved because they represent the remaining biodiversity of the region. They should not be sacrificed for development. The recent flood of energy applications will cumulatively impact these communities. The Imperial Valley could be considered one of the most endangered parts of the California Desert.

The removal of well established plant communities can increase the spread of invasive weeds like Sahara mustard, red brome grass and Russian thistle. Miles of roads and trenches will need to be built. Huge swaths of vegetation will need to be cleared for turbine foundations. **P264-17**

Wildfires:

The spread of weeds would increase the probability of wildfires on the site. Should a turbine explode of a lightning strike occur, how would this be mitigated? Who is financially responsible for wildfire suppression? Pattern Energy should take full financial responsibility for wildfire damage and suppression. Weeds are usually controlled by herbicides such as Roundup. How much herbicide will actually be used on this entire site and how would that impact wildlife and public health? **P264-18**

Rare Plants:

Harwood milk-vetch, brown turbans, deboltia, Wolf's cholla, and Thunders pilostyles were all found on the site. This means significant habitat for this species will be removed from an already development impacted Imperial Valley.

Plant surveys found 12 special status plant species on the site.

Surveys for rare plants were not conducted in the late summer or early fall. This is the time of the monsoon season. The October surveys may have been too late to detect some species on the site. Plus plant surveys did not cover the entire site Right of Way. Surveys were only conducted within a limited diameter around the development. **P264-19**

Below is a complete list of plants that should have been surveyed for on the site:

Abronia villosa var. *aurita*
Amaranthus watsonii
Chamaesyce abramsiana
C. platysperma
Ditaxis serrata var. *californica*

Horsfordia alata
H. newberryi
Penstemon thurberi
Teucrium cubense ssp. *Depressum*

Wildlife:

Page 3.32-1 of the Wildlife Resources chapter says: "Despite the above-mentioned usage, the majority of the proposed OWEF site is relatively undisturbed." Then to protect wildlife, the No Project alternative which designates the area a no - wind zone is best to minimize disturbance. P264-20

Flat-tailed horned lizard *(Phrynosoma mcallii)*

The Ocotillo Wind Express project will impact a significant portion of the habitat and connectivity of the flat-tailed horned lizard. This species has a very limited range left in the United States and has lost a larger percentage of its habitat in Imperial Valley to agriculture and other human use. It is important to conserve what is left?

Mitigation measures are inadequate to prevent mortality and habitat destruction of Flat-tailed horned lizard. 15 mph speed limit is too fast, based on protocols for Blunt-nosed leopard lizard in construction sites. 5 mph should be the speed limit in habitat to prevent road kill, and a trained biologist should escort all trucks and traffic through areas of FTHL habitat. When any lizard is encountered, the biologist shall stop the vehicle convoy and move the lizard off the road and into a safe place such as a burrow or cover of a shrub. All constructions sites in FTHL habitat should be fenced with flashing fence 20 inches high, so that all FTHL can be removed out of harm's way. If not fenced, FTHL will try to return to familiar areas. P264-21

Fragmenting and destroying habitat for this rare species will only lead to further efforts to list it under the Endangered Species Act. Avoidance is the only sure way to minimize direct mortality and habitat disturbance.

Mitigation measures for avian predators of FTHL are inadequate, because there is no way to prevent Loggerhead shrikes from using new structures in the desert as perches from which to hunt. Ravens will also be attracted to new perches, regardless whether food scraps are cleaned up or not. Fences, yards, lay down areas, and other structures will provide hunting perches and nesting sites for these avian predators, and no mitigation strategy is given in the DEIS for this increased threat to FTHL.

How will new roads be mitigated that are to be built in FTHL habitat as recreational users and OHV users find these new routes and increase traffic and roadkill mortality?

The issue of connectivity between the Yuha Basin ACEC-FTHL core area, and core areas to the north in West Mesa was not addressed. How will construction and habitat disturbance impact FTHL movement and genetic flow in the greater region? How will decreased connectivity be mitigated? **P264-21, cont.**

Barefoot Banded Gecko: *(Coleonyx switaki)*

The entire site was not surveyed for this species. The DEIS states that the applicant avoided the sites surveyed for this species for their new configuration, but there is no mention of the areas not surveyed in the proposed ROW for the species. **P264-22**

Burrowing Owl: (*Athene cunicularia hypugaea*)

Page 4.21-5 of the DEIS states that surveys for Burrowing owl in 2010 were not completed in the project area and will be done in 2011. This is unacceptable, as more occupied burrows could be found, and more compensation habitat may need to be located and set aside. These numbers are unknown, and the project should not be approved until these surveys are complete and the public given the opportunity to review the surveys.

The location of off-site compensation lands should be determined and made public before the approval of the project, so that any lands can be surveyed to see if they are adequate for burrowing owls, and how many resident owls already occupy the area, if any

California Department of Fish and Game guidelines from 1993 should be followed, as providing the strongest protective measures for the species (Burrowing Owl Survey Protocol and Mitigation Guidelines. 1993. Prepared by the California Burrowing Owl Consortium. www.dfg.ca.gov/wildlife/nongame/docs/boconsortium.pdf, accessed November 10, 2009) **P264-23**

The CDFG burrowing owl guidelines (ibid.:i) emphasizes "maintaining burrowing owls and their resources in place rather than minimizing impacts through displacement or owls to an alternate site."

The guidelines (ibid.:10) also recommends that for off-site mitigation, replacement of occupied habitat with 9.75 acres of occupied habitat per pair or single owl found, or 13 acres of contiguous habitat per pair or single bird, or 19.5 acres of unoccupied habitat per pair or single bird. This higher ratio should be used instead of the lower ratio of 6.5 acres of come satin land for each occupied burrow, as stated in the DEIS.

The Imperial Valley is one of the last areas in the California desert with a strong population, and the species in declining in other parts of its range. Further disruption of foraging and nesting territories, and disturbance of habitat will lead to a degradation of the population here. Cumulative impacts due to other proposed large-scale projects will add to the decline.

Recent surveys have shown a 27-percent drop in the number of breeding burrowing owls in Imperial Valley. The population has declined from an estimated 5,600 pairs in the early 1990s to 4,879 pairs in 2007, then dropped sharply to 3,557 pairs in 2008.

P264-23, cont.

Peninsular Bighorn Sheep *(Ovis canadensis nelsoni):*

The DEIS has determined that with the exception of the I-8 island portion of the project, the proposed site is not occupied by Peninsular bighorn sheep. This is based on a three month survey starting in March, 2011 and an initial 8 day survey that took place in 2009. The DEIS does not make it clear as to how much of the project ROW application was fully covered by the surveys.

The Ocotillo Wind Express site represents important foraging and connectivity habitat for endangered bighorn sheep.

173 acres of designated Critical Habitat will be destroyed. This is a violation of the Endangered Species Act.

The project will block access to large bighorn sheep foraging areas and block connectivity corridors from mountain range to mountain range. Bighorn biologists Dr. John Wehausen and Dr. Vern Bleich have concluded that radio telemetry studies of bighorn sheep in various southwestern deserts, including the Mojave Desert of California, have found considerable movement of these sheep between mountain ranges.... Consequently, intermountain areas of the desert floor that bighorn traverse between mountain ranges can be as important to the long-term viability of populations as are the mountain ranges themselves.

Alluvial fans near steep rocky terrain can provide crucial foraging habitat for big horn sheep

The BLM is only proposing a 1 to 1 basis ratio of mitigation habitat to replace the critical habitat with. Because this species is Federally Endangered, we believe BLM should require a 5 to 1 ratio of mitigation land be bought for the Critical Habitat compensation.

The DEIS also admits that the project will alter the behavior of bighorn sheep, but give very little details on how this would be mitigated.

P264-24

It is unfortunate that the BLM prefer an alternative that would site an industrial project next to an important habitat for an Endangered Species. **P264-24, cont.**

P264-25

Bats: The DEIS states that most of the bats flying in the area are at lower elevations. Recent literature documenting bat fatalities at major wind farms in the United States is available. In fact some literature suggests that the taller wind turbines are actually more dangerous for bats. The 2008 article in Scientific American explains the issue better: **On a Wing and Low Air: The Surprising Way Wind Turbines Kill Bats by** David Biello, http://www.scientificamerican.com/article.cfm?id=wind-turbines-kill-bats

"The Summerview wind farm, which Baerwald studied, kills hundreds of bats every year, particularly during the fall migration period that has just begun. But bats that find their way via sonar should have no trouble detecting fast-moving objects like the 200-foot- (60-meter-) long blades on the 300-foot- (90-meter-) tall turbines that spin as quickly as 160 miles (255 kilometers) per hour. And before the installation of these new, taller turbines bat kills had been practically nonexistent."

"As turbine height increases, bat deaths increase exponentially," says ecologist Erin Baerwald of the University of Calgary in Alberta, who led research into the deaths as part of her master's project. "What we found is a lot of internal hemorrhaging."

Bat fatalities have now been documented at nearly every wind facility in North America. The problem has been documented as rapidly expanding air in the lungs caused by the sudden drop in pressure from the spinning turbine blades. The symptoms involve internal hemorrhaging called barotrauma. The extent of the problem is not well known due to the fact that scavengers such as coyotes pick up the carcasses of the bats before surveyors can find them. Many bats have been determined to fly into spinning blades after the initial onslaught of barotrauma.

One of the reasons the DEIS determines that there are low bat population numbers on the site is because there is no roosting habitat, but the southern end of the project site is located adjacent to the Jacumba Mountains which provide topography more favorable to roosting.

Surveys were conducted for 9 nights at four different times of year. Only 5 species were detected. The San Diego Natural History Museum has made the following list of bat species that occur in Imperial Valley:

California Leaf-nosed Bat	*Macrotus californicus*
Pallid Bat	*Antrozous pallidus pallidus*
Big Brown Bat	*Eptesicus fuscus pallidus*
California Myotis	*Myotis californicus stephensi*

Little Brown Myotis	*Myotis lucifugus occultus*
Cave Myotis	*Myotis velifer brevis*
Yuma Myotis	*Myotis yumanensis yumanensis*
Western Pipistrelle	*Pipistrellus hesperus Hesperus*
Townsend's Big-eared Bat	*Plecotus townsendii pallescens*
Western Mastiff Bat	*Eumops perotis californicus*
Pocketed Free-tailed Bat	*Nyctinomops femorosaccus*
Mexican Free-tailed Bat	*Tadarida brasiliensis Mexicana*

More surveys covering the entire site may uncover more occurrences on the site.

There are very few listed mitigation measures for bats in the DEIS.

P264-25, cont.

Golden Eagles: In 2010, 21 golden eagle nests were observed accounting for five golden eagle territories. The DEIS admits that surveys were conducted in drought conditions and these numbers could actually not be accurate. We would like to request that at least two more years worth of surveys be conducted before the ROD is made.

The following reference describes habitat requirements for the golden eagle:
Area requirements:

"Golden Eagles have large home ranges that are defended, particularly during the breeding season. Home range size may increase or decrease during the non-breeding season."
"Researchers who examined breeding-season territories reported that average sizes ranged from 20 to 54 km², whereas average sizes of year-round territories ranged from 20 to 92 km² (Kochert et al. 2002). In the SRBP, Dunstan et al. (1978) reported that average home range size for three pairs of eagles decreased from 32 km² during the breeding season to 8.9 km² during the non-breeding season."

"Non-breeding territory size of the eight pairs averaged 305 km², ten times larger than their mean breeding-season territory size."

Threats to eagles from transmission lines are outlined here:

"Electrocution appears to be a widespread source of mortality for Golden Eagles in North America (Benson 1981, Harness and Wilson 2001). Over 300 electrocutions of Golden and Bald eagles were documented in the United States during a 3-yr period (Boeker and Nickerson 1975). During another 2-yr period, an additional 250 Golden Eagles were found electrocuted in 14 states, mostly in Utah (32%), Nevada (24%), Idaho (12%), and Montana (10%) (Boeker and Nickerson 1975). Many electrocutions occurred along a few stretches of power line; for example, 37 electrocuted Golden Eagles were found along 24 km of power line in Colorado, and 47

P264-26

electrocuted Golden Eagles were found along 19 km in Utah. Sixteen (94%) eagles killed by electrocution in the Pawnee National Grassland in Colorado were immature. Nearly all documented electrocutions occurred on distribution lines about 8-9 m high with lines spaced 1.0-1.5 m apart. Twenty immature birds banded in the SRBP from 1968 to 1971 were found dead, and 60% of these had been electrocuted (Beecham and Kochert 1975). Eighty-two percent of 416 carcasses found along power lines during surveys in Idaho, Wyoming, Utah, Nevada, New Mexico, and Oregon during a 3-yr period were Golden Eagles (Benson 1981). Of 52 eagle carcasses that could be aged, 54% were immatures, 40% were subadults, and 6% were adults, compared with 183 live eagles aged during transect surveys in which 68% were subadults or immatures and 32% were adults."

Of 26 known mortalities in a radio-tracked population of Golden Eagles during the mid-1990's in California, 19% died from electrocution (Hunt et al. 1997)."

And:

"Golden Eagles are potentially at risk of collisions with wind-turbine blades at wind-resource areas. Of 26 known mortalities in a radio-tracked population of eagles during the mid-1990s in California, 35% died from collisions with wind-turbine blades (Hunt et al. 1997). At this site, a high density of nesting eagles and an important foraging area in the vicinity of the wind-generation site likely contributed to the rate of collisions (Hunt et al. 1997)."
DeLong, J. P. 2004. Effects of management practices on grassland birds: Golden Eagle. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/literatr/grasbird/goea/goea.htm (Version 28MAY2004).

P264-26, cont.

A recent article from the LA Times outlined recent studies of bird mortality and wind farms:.

"The golden eagle is the largest bird of prey in North America, capable of diving upon its quarry at blinding speeds of 150 miles per hour. Due to their fierce flying and majestic size, the eagles have trouble navigating around the wind turbines as they hunt for prey. Bell explains that the cause of death for golden eagles at Altamont Pass is usually blunt-force trauma.
On-site surveys conducted by field biologists have found that approximately 2,000 raptors, including golden eagles, red-tail hawks, American kestrels and prairie falcons, are killed annually at Altamont Pass, the Times reports. Throughout the U.S., almost 440,000 bird fatalities occur each year at other wind farms.

http://articles.latimes.com/2011/jun/06/local/la-me-adv-wind-eagles-20110606

The following link shows a video of a raptor colliding with a modern wind turbine in Spain: http://www.windaction.org/videos/23904

The Bald and Golden Eagle Protection Act still has rigorous guidelines prohibiting Take:

P264-27

United States United States Code Annotated Currentness. Title 16. Conservation. Chapter 5A.

***Summary:** The BGEPA prohibits any form of possession or taking of both bald and golden eagles. The statute imposes criminal and civil sanctions as well as an enhanced penalty provision for subsequent offenses. Further, the BGEPA provides for the forfeiture of anything used to acquire eagles in violation of the statute. The statute excepts from its prohibitions on possession the use of eagles or eagle parts for exhibition, scientific, and Indian religious uses.*

*Protection and Conservation of Wildlife. Subchapter II. Protection of Bald and Golden Eagles. Citation: 16 U.S.C. 668a - d **Summary:** The BGEPA prohibits any form of possession or taking of both bald and golden eagles. The statute imposes criminal and civil sanctions as well as an enhanced penalty provision for subsequent offenses. Further, the BGEPA provides for the forfeiture of anything used to acquire eagles in violation of the statute. The statute excepts from its prohibitions on possession the use of eagles or eagle parts for exhibition, scientific, and Indian religious uses.*

Statute in Full:

§ 668. Bald and golden eagles

(a) Prohibited acts; criminal penalties

Whoever, within the United States or any place subject to the jurisdiction thereof, without being permitted to do so as provided in this subchapter, shall knowingly, or with wanton disregard for the consequences of his act take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or in any manner, any bald eagle commonly known as the American eagle, or any golden eagle, alive or dead, or any part, nest, or egg thereof of the foregoing eagles, or whoever violates any permit or regulation issued pursuant to this subchapter, shall be fined not more than $5,000 or imprisoned not more than one year or both: Provided, That in the case of a second or subsequent conviction for a violation of this section committed after October 23, 1972, such person shall be fined not more than $10,000 or imprisoned not more than two years, or both: Provided further, That the commission of each taking or other act prohibited by this section with respect to a bald or golden eagle shall constitute a separate violation of this section: Provided further, That one-half of any such fine, but not to exceed $2,500, shall be paid to the person or persons giving information which leads to conviction: Provided further, That nothing herein shall be construed to prohibit possession or transportation of any bald eagle, alive or dead, or any part, nest, or egg thereof, lawfully taken prior to June 8, 1940, and that nothing herein shall be construed to prohibit possession or transportation of any golden eagle, alive or dead, or any part, nest, or egg thereof, lawfully taken prior to the addition to this subchapter of the provisions relating to preservation of the golden eagle.

P264-27, cont.

Mitigation:

While the mitigation ideas for protecting golden eagles sound promising, we are concerned that they will be very effective.

The company proposes to install "virtual radar" complete with cameras which will have people stationed at them watching for raptors. If a golden eagle is spotted, the turbine will be shut down until the bird leaves the area. Will the quality of the camera image allow the operator to differentiate between golden eagles and other raptors?

The raptor camera monitoring is only proposed to take place for three years after the project is complete, yet the lifespan of the project is expected to be 30 years. That leaves 27 unmitigated years. How do you expect to protect raptors for the full lifespan of this project?

Please come up with a more plausible mitigation plan.

P264-27, cont.

Raptor Mitigation: Will the radar and surveillance system be used to monitor other raptors? Will turbines be shut down to protect red tailed hawks, ospreys, prairie falcon and peregrine falcons, etc. (all found on the project site)

Will radar monitoring biologists be authorized to shut turbines down when a raptor is detected on the site?

Will mitigation standards be voluntary or mandatory for the applicant?

P264-28

California Condors:

California condors have historical presence in the area of the project site. They are spotted west of there and some biologists believe they could find their way back. How would this be mitigated should the species find its way back in the next three decades?

P264-29

Avian Point Count: The avian point count states that the project site does not support large populations of resident avian species, but the DEIS admits that surveys took place on drought years. More surveys on years that have more moisture and optimal conditions should be conducted.

P264-30

Migration Corridor for Water Birds: The DEIS claims that the project site is not a migration corridor for water birds. The final EIS/EIR for the Sunrise Powerlink has this statement:

"Because of the comparatively low elevation of San Diego County's mountains (lower than the San Bernardino and San Jacinto mountains to the north), many birds migrating from a winter range in western mainland Mexico to a breeding range in northern California, the Pacific

P264-31

Northwest, or Alaska use San Diego County as a corridor for crossing from the desert to the coastal slope. This migration happens all along the east side of San Diego County's mountains but is most concentrated in the canyons and valleys that lead from southeast to northwest, such as Grapevine Canyon and San Felipe Valley. San Felipe Valley is the most heavily used corridor (Unitt, 2007)."

Please re-evaluate the project site value for migratory water birds.

P264-31, cont.

Cultural Resources:

According to the DEIS, 20,000 lithic knapping stations are found within the project site, numerous prehistoric trails, 48 camp sites, hearths, cremations (some with human remains), dance circles, a possible fish geoglyph, ceramic shards, numerous agave roasting pits, sleeping circles, milling stones, cairns, and rock alignments of various shapes (one triangular). The entire northwestern part of the project site is described as an agave procurement area, with numerous agave roasting sites, some covering acres and containing many pits. One area had 108 pits for roasting agaves.

This whole area is very rich in cultural artifacts, and should not be disturbed on such a large scale, with roads and industrial constructions zones. Lay down yards for wind turbine generator equipment could fragment this important cultural landscape greatly. Unknown finds may be destroyed. This area should be protected as an Area of Critical Environmental Concern, along with the adjacent eastern areas where the prehistoric shorelines of Lake Cahuilla exist.

P264-32

We strongly disagree that the proposed alternative will have minimal significant impacts under CEQA, NEPAL, and minimal cumulative impacts. The mitigation measures are inadequate to protecting these cultural features and artifacts, including graves, places a zone to avoid a site a mere 100 feet from a construction area will bring in significant indirect impacts to these resources. Fragmentation of a large cultural landscapes, roads cutting through ancient trails, the increased likelihood of accidental damage due to the large scope of the project, and disruption of the context for so many artifacts will be considerable and negative.

The many miles of new roads that will have to be built will encourage off-roading into sensitive areas, but restricting access, as is suggested in one mitigation measure, will cut off a large area of public land and disrupt wildlife connectivity.

Avoidance of this landscape in the project area is the only way to ensure protection while continuing this area as public land.

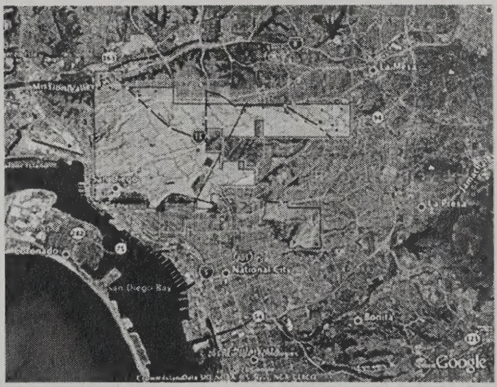
Other Colorado River Native American Tribes should also be consulted, such as the Chemehuevi and Fort Mojave. People traveled great distances and many other tribes than those listed probably have cultural claims to the project site.

P264-32, cont.

Conclusion:

Experience in the last three years has taught us that the BLM "Fast Tracking" or "Priority Projects" have not helped any of us. Streamlining review of projects only results in unresolved issues and additional expense.

As BLM is quite aware, this project has strong opposition from the public. The region was designated Class L lands under the CDCA decades ago to protect outstanding cultural, biological and visual resources. Furthermore, people of greatly differing opinions have all come together to oppose this project. Off highway vehicle users, environmentalists, Native Americans and property owners all dislike this project. The project is simply way too big. The Mojave Desert Blog recently posted a map of the project boundary superimposed over the city of San Diego, California. This really shows how unreasonably large the footprint of the Ocotillo Wind Express Project.



Ocotillo Wind Express Project footprint superimposed over the city of San Diego
www.mojavedesertblog.com

P264-33

We would like to request that the BLM chooses a No Action Alternative that designates a conservation status for the region.

Thank you,

Comment Letter P264

Kevin Emmerich
Laura Cunningham
Basin and Range Watch
P.O. Box 70
Beatty, NV 89003
www.basinandrangewatch.org

Comment Letter P265

From: Nicole D"Angelo
To: Angelina Havens; John Renison; Jack Terrazas; Michael Kelley; Gary Wyatt; Ray Castillo; conrad@theabf.org
Subject: OCOTILLO EXPRESS WIND PROJECT
Date: Wednesday, October 05, 2011 2:51:24 PM

Dear All,

P265-01

I am writing to you all today because I am deeply distressed and saddened by the proposal to disrupt the natural beauty of the Anza Borrego Desert with the Ocotillo Express wind power project.

My family and I have visited and hiked many miles of the Anza Borrego Desert, including Ocotillo. We visit for the park's pristine beauty, the amazing geology, the native human history, the quiet peacefulness, the wildlife viewing, the clean air, the dark skies. Certainly this project would rob the area of all of these things!

This project would disrupt all that the park and surrounding areas have to offer. Certainly, this protected parcel of land was established to ward off such development.

P265-02

We are certain you are all aware of the concerns over bird and bat deaths due to collisions with the wind turbines and burst lungs and blood vessels from the changes in air pressure caused by the turbines. But please consider these issues: soil erosion and compaction from the construction and maintenance of the tower structures, changes in hydrology, changes in bird migration routes, noise pollution, the unknown effects of vibration, and the changes in terrain impacting foraging/food supply for all living creatures--from microorganisms to big horn sheep.

P265-03

One more item to consider is the dark sky. Our world is so polluted by unnatural night light that I did not observe the Milky Way Galaxy until August of this year, just after my 42nd birthday. This was possible by going to the Anza Borrego State Park, and thanks to the continued work of many people involved with the establishment of the park's Dark Sky designation. If this project goes through, towers and turbines would need to be lit at night, and the dark skies of Anza Borrego would be gone. People gain respect for nature and all things outside of themselves by being profoundly affected by such majestic sights such as that of our Milky Way Galaxy and our universe.

P265-04

Most of all, please consider that in depth research about the negative impact of wind energy has not been factually well-established --it is a new technology-- and that your personal decision could negatively impact the future of all living things.

Humans have taken over so much of planet Earth for our own personal selfish benefits and *all living creatures deserve to have their own space devoid of human intervention.*

If you agree with nothing else in my letter, please consider this: This project is not vital or necessary to human survival.

P265-04, cont.

Please adopt the "NO project" alternative!

Sincerely,

Nicole D'Angelo

Comment Letter P266

From: Rafael Vargas
To: Angelina Havens
Subject: Ocotillo Express Wind Energy Project
Date: Thursday, October 06, 2011 6:02:52 PM

---

hi my name is Rafael Vargas and to whom it may concern. I just wanted to say that i highly
disagree with the plans Ocotillo Express has for building their 155 wind turbines in the
California's southern desert near Ocotillo. My reasons for not allowing Ocotillo Express to
proceed with their intended plans are the following. First of all the wind turbines are not
necessary their are many more environmentally friendly ,green alternatives for every kilowatt
of energy the project would generate could be produced more reliably, cheaply **P266-01**
and sustainable with rooftop solar and other distributed renewable energy sources, in the
cities where the power will be used. I really think this topic should be over viewed and
discussed more before any major action are taken to move forward with the intentions of
Ocotillo Express in the Southern Desert near Ocotillo. The reason for witch i make this such
a big deal is because i was raised and born in the imperial valley and i am very familiar with
the Ocotillo Desert located near the imperial valley and i have personally appreciated the
natural beauty and wonders it produces like its wild life that in some situations are not found
in many other places its almost exclusive to the southern desert near Ocotillo.
like the flat tailed horned lizard(proposed for listing under the endangered species Act) they **P266-01**
will be greatly affected by this project and that troubles me. That is not including that the
Ocotillo Express Project will also devastate vita habitat for the endangered peninsular big
horn sheep, and add significantly to the cumulative impact on the above species from other
energy and agricultural projects in the area. That pose a serious threat of injury and death to
golden eagles and other raptors known to live in the are, as well as the Le Conte's thrasher,
burrowing owls, several other sensitive birds species, and as many as twelve species of bats.
This project is a big issue because it will destroy so much more than what they have taken to
account every one should be aware of all of the pros and cons of this project
before officially deciding to move forward with this wind turbine installation. My last point i **P266-03**
would like to make is to encourage the BLM to adopt the "no project" alternative. All of the
points i have talked about should be discussed very thoroughly in front of the public and
Ocotillo Express to see if this project is really worth all that its going to destroy just for the
benefit of power that could be harvested in many alternative ways more efficiently.
Rafael V

Comment Letter P267

From: Patsy [patti23@cox.net]
Sent: Wednesday, October 05, 2011 7:13 AM
To: cperry@blm.gov
Cc: Angelina Havens; John Renison; Jack Terrazas; Michael Kelley; Gary Wyatt; Ray Castillo; terryweiner@sbcglobal.net
Subject: Ocotillo Express Wind Energy Project

Mr. Cedric Perry
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Mr. Perry,

It is with great urgency that I urge you to reconsider the "No Project" alternative, in lieu of the Ocotillo Wind Energy Project. This proposed project will destroy a beautiful natural desert and its habitat for ever. There is wildlife in this desert that is in danger of endangered and cannot be replaced once it is lost. This desert it home to the Peninsular bighorn sheep and the flat-tailed horned lizard which is a candidate for endangered species. This project also threatens the golden eagle, the LeConte's thrasher, burrowing owls and 12 species of bats. It is vital to the preservation of our heritage that this project be replaced with an alternative. Please adopt the "No Project" alternative. **P267-01**

It is imperative that the public be heard and I ask that you extend the public comment time to 30 days. It is not in the best interest of the public that you propose to destroy this portion of Anza-Borrego Desert State Park. **P267-02**

I have been a Southern California resident since 1953 and have watched the sun rise over this beautiful desert on many occasions. I have enjoyed its natural wild beauty and solitude, please do not destroy what nature has given us to enjoy. **P267-03**

Patsy Wilson
California Resident

Comment Letter P268

From: Houser, Misty
To: Angelina Havens
Subject: Letter of Support
Date: Wednesday, October 05, 2011 1:43:40 PM
Attachments: image001.gif
image002.gif
image003.gif
image004.gif
image005.gif
image006.gif

Dear Angelina,

I write this email as a letter of support for Pattern Energy's Ocotillo Wind Energy Project. I feel this project is not only good for Imperial Valley, but for the state of California as a whole. **P268-01**

Thank you for your time.

Misty R. Houser
Senior Staffing Specialist
Imperial Valley

2344 South 2nd Street, Suite C
El Centro, CA 92243
760-352-2426 phone
760-455-5404 cell
760-406-9721 fax

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misty.houser@manpower.com
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Scott Cashen, M.S.—Independent Biological Resources and Forestry Consultant

October 6, 2011

Mr. Cedric Perry
Project Manager
Bureau of Land Management
California Desert District
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Subject: Comments on the Draft Environmental Impact Statement and Draft Environmental Impact Report Prepared for the Ocotillo Express Wind Energy Project

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Dear Mr. Perry:

This letter contains my comments on the Draft Environmental Impact Statement and Draft Environmental Impact Report ("DEIS/DEIR") prepared for the Ocotillo Express Wind Energy Project ("Project"). Pattern Energy (hereafter referred to as the "Applicant") has proposed the construction, operation, maintenance, and decommissioning of a wind energy facility on approximately 12,436 acres in Imperial County, California. The Project would be located on Bureau of Land Management ("BLM") administered land except for approximately 26 acres of private land near the center of the proposed site. Additionally, the Project would require 487 acres of private and public land outside the Project boundaries for road access and collection lines. The Project involves the installation of up to 155 wind turbine generators (or "WTGs") that have a total rotor swept area of up to 1,586,810 square meters.

I am an environmental biologist with 19 years of professional experience in wildlife ecology, forestry, and natural resource management. To date, I have served as a biological resources expert for over 30 projects, including 22 renewable energy facilities. My experience in this regard includes testifying before the California Energy Commission and assisting various clients with evaluations of biological resource issues. My educational background includes a B.S. in Resource Management from the University of California at Berkeley, and a M.S. in Wildlife and Fisheries Science from the Pennsylvania State University.

I have gained particular knowledge of the biological resource issues associated with the Project through the scientific research I have conducted in the Colorado Desert, and through my work on numerous solar and wind energy projects. I am submitting the comments contained herein on behalf of Backcountry Against Dumps, Protect Our Communities Foundation, the Donna Tisdale, and myself. My comments are based on my review of the environmental documents prepared for the Project, a review of scientific literature pertaining to biological resources known to occur in the Project area, consultations with numerous biological resource experts, and the knowledge and experience I have acquired during more than 19 years of working in the field of natural resources management.

The proposed Project site contains thousands of acres of land within a relatively undisturbed portion of the Colorado Desert. This land contains a large block of habitat that supports many unique plant and animal species, including the little San Bernardino Mountains linanthus, Peninsular bighorn sheep, flat-tailed horned lizard, and golden eagle. It contains an estimated 859 acres of Waters of the State, 239 acres of Waters of the U.S., 12 special-status plant species, 23 special-status wildlife species, 8 sensitive natural communities, and designated "Essential Habitat" for the Peninsular bighorn sheep. The biological resources survey data that were collected on the site demonstrate that it possesses extremely high biodiversity. The proposed Project is likely to have an adverse affect on all of these resources. The ecological consequences of fragmenting and degrading a broad expanse of relatively undisturbed Colorado Desert habitat cannot be mitigated.

The DEIR's Failure to Provide a Thorough Project Description Prevents an Adequate Assessment of All Impacts to Biological Resources

Evan Hewes Highway

The Project would require extension of the Evan Hewes Highway.[1] However, the DEIS/DEIR lacks a complete description of the highway extension, including its length, width, and substrate. Furthermore, the DEIS/DEIR lacks information on the sensitive biological resources that may be impacted by the proposed highway extension.[2] Although the DEIS/DEIR suggests surveys for some sensitive biological resources will be completed along the proposed highway extension route before Project construction (e.g., plants, burrowing owl), it fails to require surveys for others (e.g., flat-tailed horned lizard, bats, barefoot banded gecko, jurisdictional waters). As a result, the DEIS/DEIR fails to disclose, analyze, and mitigate all of the Project's impacts to sensitive biological resources, and it fails to ensure the Project will comply with all applicable regulations (e.g., Clean Water Act requirements). **P269-01**

Sand/Gravel Pits

The Project would require sand and gravel from one or more source areas.[3] Obtaining the sand and gravel will result in the disturbance of up to 15 acres.[4] The DEIS/DEIR fails to disclose, analyze, or mitigate the potentially significant impacts associated with acquiring sand and gravel for the Project. Furthermore, the DEIS/DEIR's failure to identify the precise location(s) of the sand and gravel precludes an independent assessment of the impacts associated with this aspect of the Project. **P269-02**

According to the DEIS/DEIR, "[a]ny sand and gravel source will require biological and cultural resource clearance and the appropriate level of BLM NEPA analysis would have to be completed prior to utilization."[5] Acquisition of sand and gravel from one or more offsite sources has the potential to cause significant direct, indirect, and cumulative impacts on sensitive biological resources. These impacts need to be disclosed, analyzed, and mitigated by the DEIS/DEIR.

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[1] BTR, p. 6. The DEIS/DEIR also refers to this as the Evan "Hughes" Highway.

[2] *See* BTR, Figures 3 through 6, and 8 through 10.

[3] DEIS/DEIR, Plan of Development, p. 6.

[4] Id.

Depending on the ultimate source for the sand and gravel, its acquisition could impact sensitive resources not analyzed by the DEIS/DEIR. For example, the acquisition of 60,100 tons of coarse aggregate from Thermal, California (as suggested in the DEIS/DEIR), has the potential to cause significant impacts on the state and federally listed desert tortoise.[6] In addition, the acquisition of coarse aggregate from land near Thermal would likely be subject to the provisions of the Coachella Valley Multiple Species Habitat Conservation Plan ("HCP"). The DEIS/DEIR lacks a mechanism for ensuring the Project's impacts would comply the HCP, or other regulations governing sensitive biological resources that may occur in the sand and gravel source areas.

Moreover, the Project timeline appears to preclude adequate NEPA analysis, and the surveys that will be required to document the sensitive biological resources that may be impacted by sand and gravel acquisition.[7] For example, federal guidelines require desert tortoise surveys during the organism's activity period, which is defined as April through May or September through October. Unless these surveys have already been completed, the Applicant will be unable to conduct the surveys prior to sand and gravel acquisition (thus, precluding adequate NEPA analysis). This could result in unmitigated significant impacts that were not disclosed in the DEIS/DEIR.

P269-02, cont.

Redesigned Project Footprints

Based on information obtained from the biological resource surveys, cultural resource surveys, and a delineation of waters of the U.S., the Applicant elected to abandon the original site plan and modify the project to develop a Proposed Action that avoided sensitive biological and cultural resources and minimized impacts on jurisdictional waters.[8] The subsequent Project was redesigned at least one additional time between winter 2010/2011 and spring 2011.[9] The DEIS/DEIR fails to identify the boundaries of each Project design in relation to the currently proposed Project. This precludes an evaluation of the adequacy of the biological resources survey efforts, and thus, the adequacy of the data in the DEIS/DEIR.

Due to redesigns of the Project, portions of the Project area have not been surveyed for sensitive biological resources (or the results of surveys were not available for disclosure in the DEIS/DEIR). I cannot evaluate the severity of this issue because the DEIS/DEIR fails to identify: a) the boundaries of each Project design in relation to the

P269-03

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[5] Id, p. 22.

[6] Id. *See also* California Wildlife Habitat Relationships System. 2005. California Department of Fish and Game. California Interagency Wildlife Task Group. CWHR version 8.1 personal computer program. Sacramento (CA).

[7] DEIS/DEIR, p. 2-11.

[8] Id, p. 2-36.

[9] BTR, p. 10.

various survey efforts; or b) the number of acres within the current Project footprint that have yet to be surveyed. At a minimum, the DEIS/DEIR must clearly identify the portions of the Project site that have not been surveyed, and it must establish a mechanism for ensuring pending survey results are disclosed to the public, resource agencies, and other decision makers. **P269-03, cont.**

The DEIS/DEIR Fails to Disclose or Analyze Potentially Significant Impacts From the Project's Structural Controls

P269-04

The Project would include "structural controls to divert runoff."[10] The DEIS/DEIR does not quantify of describe these structural controls, nor does it provide an assessment of the impacts that they would (or might) have on sensitive biological resources. Based on the information provided in the DEIS/DEIR, the structural controls were not included in the calculations of permanent and temporary Project impacts.[11]

Water is the most limiting factor to ecosystem health and viability in the Sonoran Desert.[12] Water supports groundwater-dependent plant communities (or species) such as mesquite, smoke tree, and other plants detected on the Project site. These communities provide very important wildlife habitat and they support the majority of the biodiversity found in the desert. For example, Dimmitt (2000) estimated plant communities associated with dry washes occupy less than five percent of the Colorado Desert but support 90% of the Colorado Desert's bird life.[13]

Vegetation development in desert washes ultimately depends on water supply. Structural controls used for the Project will alter hydrology, which will likely affect both the vegetation associated with desert washes on the Project site and the wildlife that depend on the vegetation.

The DEIS/DEIR Does Not Accurately Report the Extent and Severity of Project Impacts to Existing Habitat

P269-05

The DEIS/DEIR does not provide sufficient information on the types and causes of impacts that would result from the Project. Specifically, the DEIS/DEIR presents vague information on how impacts for each Project component were calculated, and in some instances the information that is presented appears to be incorrect. For example, the DEIS/DEIR reports the following:

> "Each turbine would require a maximum 400-foot diameter area (2.9 acres) temporary construction area, a permanent 60-foot by 100-foot [0.137 acres] crane

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[10] BTR, p. 5.

[11] *See* BTR, Table 1.

[12] Dimmitt MA. Plant Ecology of the Sonoran Desert Region. Available at:http://www.desertmuseum.org/books/nhsd_plant_ecology.php Accessed on 6/17/2010.

[13] Dimmitt, M.A. 2000. Biomes and communities of the Sonoran Desert region. In A Natural History of the Sonoran Desert (S.J. Phillips and P.W. Comus eds.). Arizona-Sonora Desert Museum Press. Tucson, AZ.

pad, *and* a permanent 75-foot diameter area (0.3 acre) for the tower within the temporary construction area."[14]

P269-05, cont.

Given this information, I made the following calculations:

a) 155 turbines * 2.9 acres = 449.5 acres (temporary construction area)

b) 155 turbines * 0.14 acres = 21.24 acres (permanent crane pad)

c) 155 turbines * 0.3 acres = 46.5 acres (permanent area for tower *within* the temporary construction area)

Therefore, the impacts associated with turbine construction are equivalent to:

449.5 acres (construction area) – 46.5 acres (tower area) + 21.24 acres (crane pad) = **424.24 acres** of impacts due to construction of the turbines.

The DEIS/DEIR, however, reports a total of **283.3 acres** of impacts due to turbine construction.[15] Thus, it appears the DEIS/DEIR has underreported impacts by approximately 140.9 acres at the turbine construction sites alone. Comparable discrepancies appear to exist in relation to values presented for the Project's roads and collector lines.

P269-06

Similarly, the DEIS/DEIR appears to misrepresent the types of impacts that would be caused by the Project. Specifically, it characterizes several types of permanent Project impacts as "temporary." In desert environments, natural habitat restoration in construction zones requires many decades and perhaps centuries.[16] Numerous research studies, as well as the EIS/EIRs prepared for other renewable energy projects in California's deserts, have documented the rationale for considering "temporary" impacts functionally *permanent* in the desert.[17] I have the following additional comments pertaining to the DEIS/DEIR's characterization of Project impacts:

1. The DEIS/DEIR expresses uncertainty over the ultimate fate of the roads constructed for the Project.[18] As a result, all newly constructed roads should be considered a permanent impact.
2. It is well known that when roads (both permanent and temporary) are constructed in the desert there is often a proliferation of off-highway vehicle ("OHV") activity into undisturbed areas. This results in additional habitat disturbance. The DEIS/DEIR appears to lack any analysis of, or mitigation for, the proliferation of OHV activity that is likely to occur in the Project area. Adverse environmental effects due to increased OHV activity in the Project area represent a potentially significant, unmitigated Project impact.

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[14] DEIS/DEIR, p. 2-4. [emphasis added].

[15] DEIS/DEIR, Table 2-3.

[16] Vasek, F.C., H.B. Johnson, and D.H. Eslinger. 1975. Effects of pipeline construction on creosote bush scrub vegetation of the Mojave Desert. Madrono 23(1):1-13.

[17] CEC and BLM. 2010 Feb. Staff Assessment and Draft Environmental Impact Statement and Draft California Desert Conservation Area Plan Amendment:SES Solar Two Project. p. C.2-28.

[18] BTR, p. 6.

P269-12, cont.

proposed measures would mitigate Project impacts.

Mitigation Measures Proposed in the DEIS/DEIR Are Not Sufficient to Reduce Impacts to Sensitive Plant Species

P269-13

Special-status plant surveys have not been completed across the entire Project area. However, the DEIS/DEIR appears to rationalize the omission of surveys by requiring focused botanical surveys during the appropriate blooming period prior to Project construction. These surveys are required in all portions of the Project area that have not yet been surveyed.[30] This is not a reliable mitigation strategy. First, without reliable information on the species that occur—and as a result, the level and types of Project impacts on those species—the DEIS/DEIR cannot conclude proposed mitigation would reduce Project impacts to less than significant levels. A conclusion of this nature would rely on the presumption that all impacts can be mitigated to a less than significant level. Such a presumption is unrealistic. The flora of the Desert Floristic Province is poorly understood, and surveys may yield completely unexpected results that cannot be mitigated by standard conditions.

Second, the DEIS/DEIR lacks a mechanism for disclosing the results of the surveys prior to Project construction. As a result, the DEIS/DEIR lacks a mechanism for ensuring Project impacts to special-status plants are avoided, minimized, and mitigated, and that the Project complies with regulations governing sensitive botanical resources.

Third, civil work (i.e., roads, underground electrical, foundations) for Phase I of the Project is expected to begin in the 4th quarter of 2011 and end in the 1st quarter of 2012.[31] This precludes the ability to conduct appropriately timed (i.e., spring and fall) plant surveys before Project impacts occur.

The Project would result in direct impacts to six special-status plant species (i.e., Harwood's milk-vetch, brown turbans, deboltia, Wolf's cholla, long-lobed four o'clock, and Thurber's pilostyles).[32] The DEIS/DEIR concludes these impacts would be significant, and that mitigation is required.[33] According to the DEIS/DEIR. "[w]hen feasible, construction activities should avoid special status plant species."[34] This is not an effective mitigation measure. The DEIS/DEIR first must establish what is considered "feasible", and under what conditions the Applicant will be *required* to avoid special-status plant species. Because the DEIS/DEIR fails to provide any other mitigation (e.g., preservation of off-site populations) for direct impacts to special-status plants, the Project would cause an unmitigated, significant impact to six special-status plant species.

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[30] DEIS/DEIR, p. 4.17-25.

[31] DEIS/DEIR, p. 2-11.

[32] BTR, p. 62.

[33] Id.

[34] BTR, p. 92.

Sensitive Natural Communities

The Project would result in both temporary and permanent impacts to sensitive natural communities (e.g., brittle bush scrub, desert agave scrub, mesquite thicket, smoke tree woodland, teddy bear cholla scrub, and white bursage scrub).[35] To mitigate permanent impacts to these communities, the DEIS/DEIR proposes a combination of compensation and restoration at a minimum 1:1 ratio.[36] Restoration of desert ecosystems is challenging, and after site rehabilitation is complete it may take decades or longer for a site to recover all of its components and functions.[37] Due to the inherent lag time between Project impacts and the possible success of a restoration effort, the proposed 1:1 mitigation ratio would be insufficient for reducing Project impacts to sensitive natural communities to a level considered less than significant. **P269-14**

I have the following additional comments pertaining to the DEIS/DEIR's proposed mitigation for Project impacts to sensitive natural communities:

1. The DEIS/DEIR lacks any performance standards for the proposed restoration efforts, and it fails to identify the monitoring methods that are required to determine whether restoration is "successful." As a result, it does not provide assurance that the functions and values of the sensitive natural communities impacted by the Project would be adequately mitigated. **P269-15**
2. The monitoring period (i.e., five years) proposed in the DEIS/DEIR is not commensurate with length of time it takes to restore vegetation communities in a desert ecosystem.[38] If restoration is used as a form of mitigation, monitoring must be conducted for the length of time necessary to demonstrate successful replacement of the functions and values lost due to Project construction. **P269-16**
3. The DEIS/DEIR suggests restoration of temporary Project impacts would qualify as mitigation for the Project's permanent impacts.[39] This would result in a net-loss of sensitive natural resources, and an unmitigated, significant impact. **P269-17**

The DEIS/DEIR Fails to Disclose, Analyze, or Mitigate Potentially Significant Impacts to Cryptobiotic Soil Crusts

Cryptobiotic (or cryptogrammic) soil crusts are communities of cyanobacteria, lichens, and mosses. These crusts bind fine soil particles by linked cyanobacterial fibres, which protect the soil from wind erosion. Several studies have suggested that the **P269-18** presence of cryptobiotic crusts dramatically decreases wind and water erosion.[40] When disturbed, cryptobiotic crusts lose most of their protective qualities allowing mobilization of the underlying mineral soils.[41]

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[35] BTR, p. 59.

[36] BTR, p. 91.

[37] Hailey J, and D Bainbridge. 1999. Desert Restoration: Do something or wait a thousand years? [abstract] Mojave Desert Science Symposium; 1999 Feb 25-27, Las Vegas. USGS, Western Ecological Research Center [internet]. Available from: http://www.werc.usgs.gov/mojave-symposium/

[38] BTR, p. 92.

[39] *See* BTR, p. 91.

Once the desert crust or pavement is removed (or damaged), sand may be blown several kilometers downwind, resulting in an area of indirect disturbance that can exceed the directly disturbed area by several-fold. For example, Okin et al. (2001) reported that 3,000 ha of land directly disturbed would be expected to indirectly disturb an additional 3,000 to 9,000 ha of land. The encroachment of blowing sand into adjacent shrublands has dramatic consequences for the landscape. Field observations indicate that blowing sand abrades plants, resulting in leaf stripping and damage to the cambium and therefore to the plant's ability to distribute and use water. Young plants are especially vulnerable to the effect of blowing sand as they lack woody tissue. This results in the suppression of revegetation in bare areas and the loss of vegetation on adjacent lands. Nitrogen-fixing microbial communities and cryptobiotic crusts are buried by sand, reducing inputs of nitrogen to the soil (Belnap *et al.*, 1993; Evans & Belnap, 1999).

The Project would involve ground disturbance activities that will destroy vegetation. Schlesinger and Pilmanis (1998) have reviewed field experiments in which shrubs have been removed by cutting, herbicides, or fire. These studies show variable rates of soil degradation, but in each case, "a loss of the local biogeochemical cycle associated with shrubs has allowed physical processes to disperse soil nutrients across the landscape." The progressive reduction in fertility acts in tandem with the mechanical action of sand to further decrease shrub cover, which, in turn, increases the susceptibility of the land to wind and water erosion. The permanent removal of suspension-sized particles from the soil by erosion results in a change of the soil texture, which may also reduce soil-binding properties, resulting in increased erodibility. Whether by wind or water, the fine particles and soil organic matter that are removed by erosion are key to the healthy functioning of soils because they increase soil nutrient content, soil porosity, water-holding capacity, and cation-exchange capacity. Because new vegetation growth is inhibited by blowing sand, the ability of vegetation to stem erosion is limited. This results in a negative feedback loop that ultimately results in severe land degradation.

P269-18, cont.

The DEIS/DEIR fails to disclose the abundance and distribution of cryptobiotic soil crusts in the Project area. Similarly, the DEIS/DEIR fails to fully disclose or assess the landscape-level impacts that are likely to occur once vegetation and cryptobiotic soil crusts are removed on the Project site.

The DEIS/DEIR acknowledges the adverse effects that can result from fugitive dust, and that fugitive dust has the potential to cause significant impacts to sensitive resources.[42] However, the DEIS/DEIR concludes the formulation of a dust control plan would reduce impacts to a less than significant level.[43] The DEIS/DEIR lacks the basis for this conclusion for the following reasons:

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[40] Okin GS, B Murray, WH Schlesinger. 2001. Degradation of sandy arid shrubland environments: observations, process modeling, and management implications. Journal of Arid Environments Vol. 47, No. 2, pp. 123–144. Exhibit #447.

[41] *Id.*

[42] BTR, p. 61.

P269-18, cont.

1. The Applicant's dust control plan would be implemented *during project construction.*[44] The DEIS/DEIR lacks any mitigation for the long-term effects resulting from the loss of cryptobiotic soil crusts, including on-going wind erosion that will occur after Project construction is complete.
2. The DEIS/DEIR lacks any performance standards for the proposed dust control plan, and it fails to require mitigation monitoring to ensure dust control efforts are successful in minimizing indirect impacts to sensitive resources.

The DEIS/DEIR Lacks Mitigation for Potentially Significant Impacts Due to Fire

P269-19

Construction of the Project would result in moderate probability of a wildfire.[45] Wildfires may also occur due to operation of the Project.[46] The DEIS/DEIR acknowledges that a wildfire caused by the Project could have severe consequences.[47] These include vegetation type conversion, and several types of impacts on special-status species.[48]

The DEIS/DEIR proposes several measures to minimize the risk of a Project-related wildfire.[49] However, because the DEIS/DEIR lacks any remedial mitigation (e.g., restoration), a Project-related fire would likely result in significant, unmitigated impacts to sensitive biological resources.

The DEIS/DEIR Lacks A Defensible Analysis of the Project's Contribution to Cumulative Impacts on Sensitive Botanical Resources

P269-20

The Project would result in impacts to at least six special-status plant species. The DEIS/DEIR does not provide a valid analysis of cumulative impacts to these species. Specifically, the DEIS/DEIR's analysis relies on several faulty statements.

First, the DEIS/DEIR indicates: "[t]he majority of the cumulative impacts analysis area supports undeveloped lands, and these surrounding areas support many of the same special status plant species found on the proposed OWEF site."[50] This statement is unsubstantiated.

Second, the DEIS/DEIR indicates: "[g]iven the amount of undeveloped lands within the cumulative analysis impact area and wide distribution and population sizes of the plant species found on the proposed OWEF site, the proposed OWEF and the reasonably foreseeable projects are not expected to reduce the distribution of the six special status plant species within the cumulative analysis impact area."[51] This statement also is unsubstantiated. Indeed, the DEIS/DEIR provides evidence to the contrary in stating: a) "[i]mpacts to special status plant species associated with the proposed OWEF combined with losses associated with past, present, and future projects are considered a cumulative impact because these combined impacts have potential to reduce the population sizes of those special status plant species within the cumulative impacts analysis area. For this reason, the cumulative impact would be considered significant under CEQA; and b) "[t]he population sizes of brown turbans, Wolf's cholla, and Thurber's pilostyles within the cumulative impacts analysis area *is not known*."[52]

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[43] Id.
[44] BTR, p. 61.
[45] DEIS/DEIR, p. 4.20-3.
[46] Id, p. 4.20-4.
[47] Id.
[48] Id, p. 4.20-1.
[49] Id, p. 4.20-10.
[50] DEIS/DEIR, p. 4.17-18.

P269-20, cont.

Third, despite acknowledging that the population sizes of brown turbans, Wolf's cholla, and Thurber's pilostyles within the cumulative impacts analysis area *is not known*, the DEIS/DEIR bases its cumulative impacts analysis on the assumption that the population sizes of special-status plant species throughout the cumulative impacts analysis areas is comparable to the populations documented on the Project site.[53] This assumption violates basic principles of plant ecology. Specifically, it is well recognized that plants are unevenly distributed across the landscape.[54] The distribution of plants across the landscape is based on a variety of biotic and abiotic factors (e.g., soils, nutrients, precipitation, temperature, competition, disturbance). Within the Desert Floristic Province, the factors that influence the distribution of many plant species are poorly understood. As a result, the DEIS/DEIR has no basis to conclude sizable populations of the target special-status plant species occur outside of the Project area. To the contrary, existing information indicates several of the target special-status plant species have extremely limited distribution and populations sizes in California.

P269-21

Brown Turbans

The DEIS/DEIR's analysis assumes "several million" brown turbans occur within the cumulative impacts analysis area.[55] This assumption defies common sense. Brown turbans has a heritage rank of "S1," which means it is "critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province."[56] There are eight historic (defined as not seen in the past 20 years) and one current (defined as having been seen in the past 20 years) populations of brown turbans in California.[57] Brown turbans has a limited distribution in California, and of the

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[51] Id, p. 4.17-22.
[52] Id. [emphasis added].
[53] Id.
[54] Pavlik B. 2008. The California Deserts: An Ecological Rediscovery. Univ. of Calif. Press (Berkeley). 365 pp.
[55] DEIS/DEIR, p. 4.17-22.
[56] California Department of Fish and Game, Natural Diversity Database. January 2011. Special Vascular Plants, Bryophytes, and Lichens List. Quarterly publication. 71 pp.
[57] California Native Plant Society (CNPS). 2011. Inventory of Rare and Endangered Plants (online edition, v8-01a). California Native Plant Society. Sacramento, CA. Accessed on Friday, September 30, 2011. *See*

10 documented populations (including the Project site), only three populations are known to occur on protected land (i.e., Anza-Borrego Desert State Park).[58] Because the status of brown turbans is poorly understood, Reiser (1994) recommended that all populations should be protected.[59]

Jackass-Clover

Jackass-clover has a heritage rank of "S1," which means it is "critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province."[60] There are two historic (defined as not seen in the past 20 years) and four current (defined as having been seen in the past 20 years) populations of jackass-clover in California.[61]

The Project site contains an isolated population of jackass-clover, and it represents the southernmost range of species. A population of jackass-clover on the Project site represents a significant discovery that was not disclosed in the DEIS/DEIR. The next nearest population occurs approximately 65 miles north of the Project site; however, this population has not been seen since 1936. The nearest "current" population occurs approximately 96 miles to the north. Peripheral populations, such as the one that occurs on the Project site, are extremely important for the long-term conservation of genetic diversity and evolutionary potential, especially when considering the need to adapt to future climate change. Of the seven documented populations (including the Project site), only two populations are known to occur on protected land (i.e., Mojave National Park).[62]

P269-21, cont.

Little San Bernardino Mountains Linanthus

Little San Bernardino Mountains linanthus has a heritage rank of "S2," which means it is "imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province."[63] Little San Bernardino Mountains

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also California Natural Diversity Database. 2009. Rarefind [computer program]. Version 3.1.0. Sep 3, 2011. Sacramento (CA): Wildlife & Habitat Data Analysis Branch. California Department of Fish and Game.

[58] Id.

[59] Reiser, C. 1994. Rare Plants of San Diego County. Imperial Beach, CA: Aquafir Press. Available at: http://sandiego.sierraclub.org/rareplants/.

[60] California Department of Fish and Game, Natural Diversity Database. January 2011. Special Vascular Plants, Bryophytes, and Lichens List. Quarterly publication. 71 pp.

[61] California Native Plant Society (CNPS). 2011. Inventory of Rare and Endangered Plants (online edition, v8-01a). California Native Plant Society. Sacramento, CA. Accessed on Friday, September 30, 2011. *See also* California Natural Diversity Database. 2009. Rarefind [computer program]. Version 3.1.0. Sep 3, 2011. Sacramento (CA): Wildlife & Habitat Data Analysis Branch. California Department of Fish and Game.

[62] Id.

[63] California Department of Fish and Game, Natural Diversity Database. January 2011. Special Vascular Plants, Bryophytes, and Lichens List. Quarterly publication. 71 pp.

linanthus currently meets all criteria as a candidate for federal listing.[64]

The Project site contains a population of approximately 100 little San Bernardino Mountains linanthus.[65] The population on the Project site represents the southernmost range of species, and a highly significant range extension for one of the rarest plants in California's deserts.[66] A population of little San Bernardino Mountains linanthus on the Project site represents a significant discovery that needs to have been disclosed in the DEIS/DEIR. The next nearest population occurs approximately 83 miles north of the Project site. Peripheral populations, such as the one that occurs on the Project site, are extremely important for the long-term conservation of genetic diversity and evolutionary potential, especially when considering the need to adapt to future climate change.

Little San Bernardino Mountains linanthus flowers are self-incompatible. As a result, the species requires large numbers of individuals for populations to remain viable.[67] Consequently, any direct or indirect Project impacts to the isolated population that occurs on the Project site could have catastrophic implications on the future conservation of the species.

P269-21, cont.

The DEIS/DEIR Lacks Adequate Mitigation for Cumulative Impacts to Special-Status Plant Species

The DEIS/DEIR concludes that the Project has the potential to contribute to a cumulatively considerable significant impact to special-status plant species.[68] However, the DEIS/DEIR subsequently concludes that implementation of the proposed mitigation measures would render the cumulative impact to a level considered less than significant.[69] The DEIS/DEIR further concludes that "other reasonably foreseeable projects in the cumulative impacts analysis area would include similar mitigation measures to mitigate those projects' impacts to special status plant species."[70] The DEIS/DEIR's rationale does not support the conclusion that cumulative impacts to special-status plant species would be less than significant.

P269-22

First, as discussed above, the DEIS/DEIR fails to provide any mitigation that will insure the long-term conservation of the special-status plant species that will (or may) be impacted by the Project.

Second, it is improperly speculative to assume that future projects will provide sufficient mitigation to ensure that there will be no cumulative impacts, or to assume that past projects have provided sufficient mitigation to ensure no cumulative impacts.

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[64] Dr. Jim Andre, Director of the Sweeney Granite Mountains Desert Research Center for the University of California personal communication with Scott Cashen, 30 Sep 2011.

[65] DEIS/DEIR, p. 3.18-20.

[66] Dr. Jim Andre, Director of the Sweeney Granite Mountains Desert Research Center for the University of California personal communication with Scott Cashen, 30 Sep 2011.

[67] Id.

[68] DEIS/DEIR, p. 4.17-22.

[69] Id, p. 4.17-23.

[70] Id.

Conclusions in a CEQA document must be supported by facts and analysis. Conclusory statements "unsupported by empirical or experimental data, scientific authorities, or explanatory information of any kind" are insufficient to support a finding of insignificance.[71] To the contrary, several studies have demonstrated that most rare plant mitigation projects fail from a functional perspective.[72]

P269-22, cont.

The DEIS/DEIR Lacks An Accurate Analysis of the Project's Contribution to Jurisdictional Wetlands and Waters

According to the DEIS/DEIR, "[t]he geographic scope for the analysis of cumulative impacts related to sensitive vegetative resources includes the vicinity of all reasonably foreseeable cumulative projects and extends throughout western Imperial County and southeast San Diego County."[73]

The DEIS/DEIR fails to define the scope of analysis considered for cumulative impacts to Waters of the U.S. and Waters of the State. However, it appears cumulative impacts analysis was applied to all of western Imperial County and southeast San Diego County.[74]

CEQA and NEPA regulations require a project's environmental documents to define the geographic scope of the area affected by the cumulative effect and provide a reasonable explanation for the geographic limitation used.[75] The selection of geographic boundaries and time period should be, whenever possible, based on the natural boundaries of resources of concern and the period of time that the proposed action's impacts will persist, even beyond the project life.[76] In this regard:

1. The DEIS/DEIR fails to define the specific area that was encompassed in the cumulative impacts analysis (i.e., acreage). This precludes independent analysis, or an evaluation of the validity of the DEIS/DEIR's conclusions regarding the Project's contribution to cumulative impacts.
2. The DEIS/DEIR's analysis fails to incorporate appropriate geographic boundaries. For Waters of the U.S. and Waters of the State the appropriate scope of analysis is clearly the local watershed. A watershed-level approach to

P269-23

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[71] People v. County of Kern (1974) 39 Cal.App.3d 830, 841-842.

[72] Fiedler PL. 1991. Mitigation-related transplantation, relocation and reintroduction projects involving endangered and threatened, and rare plant species in California. Final Report. Available at: nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=3173. *See also* Ambrose RF. 2000. Wetland Mitigation in the United States: Assessing the Success of Mitigation Policies. Wetlands (Australia), 19: 1-27.

[73] DEIS/DEIR, p. 4.17-17.

[74] *See* DEIS/DEIR, p. 4.17-17.

[75] CEQA Guidelines Section 15130(b)(3)

[76] Environmental Protection Agency. 1999. Consideration Of Cumulative Impacts In EPA Review of NEPA Documents. EPA 315-R-99-002.

cumulative impacts analysis has been used for other Pattern Energy wind projects, and for other renewable energy projects in the desert.[77]

The DEIS/DEIR indicates "[a] cumulative impact to jurisdictional resources would occur if the proposed OWEF combined with the reasonably foreseeable cumulative projects in the vicinity would result in jurisdictional resources becoming limited in extent within the cumulative analysis area."[78] I agree with this statement. However, significant cumulative impacts are also likely to occur if the functions and values of jurisdictional resources are impaired or degraded. Although these types of indirect impacts frequently result from development, the DEIS/DEIR lacks any analysis of the Project's contribution to indirect impacts to jurisdictional waters.

P269-23, cont.

The DEIS/DEIR indicates the Project's contribution to cumulative impacts to jurisdictional waters is potentially significant.[79] However, the DEIS/DEIR concludes: "[t]he magnitude of the cumulative impact to jurisdictional features is small given that there tens of thousands of acres of jurisdictional habitats within the cumulative impacts analysis area. The OWEF site's permanent impacts to Waters of the U.S. and Waters of the State amounts to less than 0.1 percent of the jurisdictional habitats in the cumulative impacts analysis area."[80] This conclusion is unsubstantiated. The DEIS/DEIR fails to establish the amount of jurisdictional waters within the (undefined) cumulative impacts analysis area. Moreover, the DEIS/DEIR indicates the cumulative impacts analysis did not include an attempt to quantify the amount jurisdictional waters in the analysis area.[81] As a result, the DEIS/DEIR lacks the basis for concluding the Project's contribution to cumulative impacts to jurisdictional waters would be less than significant.

The DEIS/DEIR Fails to Disclose All Impacts to the Flat-Tailed Horned Lizard

The Applicant's consultant conducted sampling to determine the presence of the flat-tailed horned lizard ("FTHL") on the Project site.[82] Twelve FTHL were detected on the sampling plots.[83] An additional six FTHL were detected during other Project survey efforts.[84] All of these FTHL were detected east of Shell Canyon Road.[85] The DEIS/DEIR does not extrapolate the sampling data to provide an estimate of the number of FTHL that may be impacted by the Project. Consequently, the DEIS/DEIR fails to fully disclose Project impacts to the FTHL.

P269-24

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[77] Contra Costa County. 2011 May. Draft Environmental Impact Report for the Tres Vaqueros Windfarm Repowering Project, p. 5-23. *See also* California Energy Commission. 2010 July. Supplemental Staff Assessment for the Calico Solar Project. p, C.2-133.

[78] DEIS/DEIR, p. 4.17-17.

[79] Id, p. 4.17-23.

[80] Id.

[81] *See* DEIS/DEIR, p. 4.17-18, which states "it is *likely* that federal non-wetland Waters of the U.S. and/or CDFG jurisdictional areas occur throughout the analysis area." [emphasis added].

[82] BTR, p. 12.

[83] BTR, p. 36.

[84] Id.

[85] BTR, Figure 5.

I estimated the number of FTHL in the Project site east of Shell Canyon Road by applying the density and detection coefficients that were used for the Imperial Valley Solar Project site. Through these calculations, I estimate the Project may impact 437 FTHL solely within the Project area east of Shell Canyon Road.

The FTHL Rangewide Management Strategy ("RMS") requires compensation for impacts to all areas of historic FTHL habitat.[86] Because the DEIS/DEIR fails to identify Project features in relation to historic habitat, it does not provide the information needed to determine whether the Project will comply with the RMS.

P269-24, cont.

The DEIS/DEIR Fails to Provide an Adequate Analysis of Impacts to the Flat-Tailed Horned Lizard

The FTHL has lost at least 49% of its historic habitat, and its rangewide population is now limited to six, primarily disjunct, populations.[87] Due to widespread habitat loss, fragmentation, and degradation, the FTHL has been a candidate for listing under the Endangered Species Act.[88] The FTHLs that occur on the Project site are part of the Yuha Desert population. Although there may be connectivity between the Yuha Desert and West Mesa populations, there are currently no empirical data to support dispersal between these two populations. As a result, the assessment of Project impacts to the FTHL should consider theYuha Desert population isolated from other extant populations.

P269-25

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[86] Flat-tailed Horned Lizard Interagency Coordinating Committee. 2003. Flat-tailed horned lizard rangewide management strategy, 2003 revision. 80 pp. plus appendices.

[87] Id,

[88] Id. p. 23.

FTHLs on the Project site represent the westernmost range of the Yuha Desert population. This is supported by the Applicant's sampling data, which concluded FTHLs do not occur further west than Shell Canyon Road.[89] Because the Project will impact FTHLs on the Project site, it will likely result in further constriction of the Yuha Desert population's extant range. Peripheral populations, such as the one that occurs on the Project site, are extremely important for the long-term conservation of genetic diversity and evolutionary potential, especially when considering the need to adapt to future climate change.

The objective of the Yuha Desert MA was to maintain a self-sustaining population of FTHLs in perpetuity. However, when the MA was designated there were no empirical data to support the theory that the MA would be large enough to maintain the population.[90] Thus, the viability of the Yuha Desert population is uncertain. The Project will exacerbate this uncertainty by causing further constriction of the FTHL range within the Yuha Desert management region. The Project's impacts are particularly significant because principles of conservation biology dictate that as reserves (or occupied areas) become smaller, they become more vulnerable to stochastic events, and the populations they maintain become more susceptible to extinction. The DEIS/DEIR fails to discuss these consequences, and as a result, it does not adequately disclose Project impacts on the FTHL.

P269-25, cont.

The DEIS/DEIR Does Not Provide Adequate Mitigation for Potentially Significant Project Impacts to the Flat-Tailed Horned Lizard

Without substantial, meaningful, and enforceable mitigation, the Project will be a significant contributor to the continued decline of the FTHL.

The DEIS/DEIR acknowledges that the Project has the potential to indirectly impact FTHL by leading to an increase in FTHL predators.[91] To mitigate this impact the DEIS/DEIR proposes a Raven Control Plan. The proposed mitigation does not insure the Project's impacts to the FTHL will be adequately mitigated.

First, as acknowledged in the DEIS/DEIR, FTHL predators include not only the common raven, but also the loggerhead shrike, American kestrel, and round-tailed ground squirrel.[92] Although populations of each of these predators are likely to benefit from the Project, the DEIS/DEIR lacks any measures to mitigate heightened predation by anything other than the common raven.

Second, the DEIS/DEIR does not provide any success criteria for the Applicant's Raven Control Plan, nor does it require the Applicant to implement adaptive management

P269-26

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[89] BTR, Figure 5.

[90] Flat-tailed Horned Lizard Interagency Coordinating Committee. 2003. Flat-tailed horned lizard rangewide management strategy, 2003 revision. 80 pp. plus appendices. p. 49.

[91] BTR, p. 65.

[92] Id.

measures in the event that raven control measures are ineffective in suppressing the population.

Third, the DEIS/DEIR only requires the Raven Control Plan to be implemented in the portion of the Project site that is within occupied (or assumed occupied) FTHL habitat (i.e., the northeastern portion).[93] Common ravens often forage >10 km from nests or perches.[94] Consequently, any Project features that benefit raven populations may indirectly impact FTHLs both within, and outside of, the Project area. As a result, the Applicant's Raven Control Plan must be applied to the entire Project area to minimize impacts to the FTHL.

Fourth, the DEIS/DEIR indicates the Raven Control Plan shall be developed to be consistent with the plan that was prepared for the Sunrise Powerlink Project.[95] However, the DEIS/DEIR fails to provide the relevant information associated with the Sunrise Powerlink Raven Control Plan. Mitigation imposed by the Sunrise Powerlink Final EIR/EIS was to "describe procedures for documenting the [raven control] activities on an annual basis," and for SDG&E to "obtain approval of this [raven control] plan from the U.S. Fish and Wildlife Service ("USFWS") prior to the start of construction."[96] Because the DEIS/DEIR fails to identify the monitoring and reporting variables associated Sunrise Powerlink Raven Control Plan, or whether the plan has been approved by the USFWS, it lacks the information needed to demonstrate an appropriate plan will be implemented at the Project site.

P269-26, cont.

Compensation

The DEIS/DEIR proposes to apply a 1:1 compensation ratio to compensate for permanent impacts to 30.3 acres and temporary impacts to 107.1 acres of occupied FTHL habitat.[97] The proposed compensation is not commensurate with Project impacts. Specifically, the DEIS/DEIR lacks any compensation for the thousands of acres of occupied FTHL habitat that will be indirectly impacted by the Project.[98] The agency approved RMS requires the applicant to compensate for indirect impacts, impacts the DEIS/DEIR's proposed mitigation generally ignores.

According to the DEIS/DEIR, compensation land shall be deeded and transferred to the BLM.[99] This suggests the Applicant will be responsible for the land acquisition. The DEIS/DEIR fails to establish a timeline for the acquisition. In addition, my experience

P269-27

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[93] BTR, p. 95.

[94] Connelly, J. W., S. T. Knick, M. A. Schroeder, and S. J. Stiver. 2004. Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming. Available at: http://www.ndow.org/wild/conservation/sg/index.shtm.

[95] BTR, p. 95.

[96] FEIR/FEIS, p. D.2-152.

[97] BTR, p. 94.

[98] *See* BTR, Figure 17.

[99] BTR, p. 95.

with other projects has been that the BLM generally lacks the authority to guarantee the long-term conservation of lands deeded to it. Consequently, the proposed mitigation measure appears to lack a reliable means of ensuring no-net loss of FTHL habitat.

The requirement to acquire FTHL compensation lands does not guarantee Project impacts to FTHL habitat will be offset. Members of the Interagency Coordinating Committee, which oversees implementation of the RMS, have expressed concerns over the limited availability of private land for habitat acquisition in the Yuha Desert MA. Consequently, before habitat acquisition can be considered a reliable mitigation measure, the DEIS/DEIR must establish ample private lands that are occupied by FTHL are available for acquisition.

P269-27, cont.

Although there will be efforts to salvage FTHLs prior to Project construction, information from translocation studies suggests lizards that are captured, handled, and moved will experience high mortality.[100] Lizards that escape capture (e.g., go undetected) are not likely to survive Project construction and operation. These two issues indicate the possibility that hundreds of FTHL will die as a result of the Project.

Indirect Impacts to Existing Habitat

The proposed Project site is within an area that is relatively undisturbed, and that provides generally continuous connectivity of natural community types. The applicant has proposed locating the Project in the middle of this undisturbed landscape. Placing the Project in the proposed location would cause considerable fragmentation to the remaining FTHL habitat outside of the FTHL Management Areas ("MAs").

The fragmentation that would be caused by the proposed Project would have numerous biological consequences that are not mitigated by the DEIS/DEIR. Two of these consequences, "edge effects" and loss of connectivity, are likely to be particularly severe on the FTHL population.

P269-28

a. Edge Effects-

Two studies have examined the response of FTHL to boundary processes between natural and anthropogenic desert landscapes (i.e., the edge effect). Both studies concluded a significant adverse edge effect on FTHLs. Specifically, Barrows et al. (2006) concluded "the only aeolian sand species that demonstrated an unambiguous negative response to the anthropogenic habitat edges was the flat-tailed horned lizard,"[101] and Young and Young (2000) concluded "[d]istance to disturbance was found to be a highly significant factor in whether or not flat-tailed horned lizards were present. Probability of presence increased significantly with increasing distance from disturbance, indicating a negative indirect effect to at least 450 m away from agricultural or urban areas."[102]

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[100] Dodd CK Jr., RA Seigel. 1991. Relocation, repatriation, and translocation of amphibians and reptiles: Are they conservation strategies that work? Herpetologica 47(3): 336-350.

[101] Barrows CW, MF Allen, JT Rotenberry. 2006. Boundary processes between a desert sand dune community and an encroaching suburban landscape. Biological Conservation 131:486–494.

P269-28, cont.

Incredibly, although the literature is unequivocal about adverse edge effects on FTHL, the DEIS/DEIR provides no compensatory mitigation for the Project's potentially significant indirect impacts to the FTHL.

Noise

P269-29

According to the Flat-tailed Horned Lizard Rangewide Management Strategy (RMS), it is not known whether noise at levels and durations anticipated in the desert negatively impact FTHLs. However, the RMS concluded effects are more likely where prolonged, loud noise occurs (such as the noise generated by the WTGs).

Relocation Strategy

P269-30

The DEIS/DEIR proposes removal surveys to move FTHL "out of harm's way."[103] However, moving lizards out of "harm's way" only partially addresses their survivorship. First, the DEIS/DEIR lacks the verification measures needed to ensure the surveys are effective in locating FTHLs. FTHLs are notoriously difficult to detect, and many of the FTHL that remain within the construction area after the clearance surveys have been completed will likely die during Project construction. Although the DEIS/DEIR proposes an annual report that includes "an assessment of the effectiveness of each avoidance and minimization measure," it fails to define the methods required for the assessment, or standards by which to evaluate "effectiveness."[104]

P269-31

Second, the DEIS/DEIR lacks any information on translocation sites, the habitat suitability of those sites, and the monitoring that will accompany translocation. The Applicant needs to develop a detailed translocation plan that is thoroughly vetted before a decision is made on the Project. At a minimum, the plan should contain:

1. An assessment of potential release sites, with special attention dedicated to evaluating the factors that limit the distribution and abundance of FTHLs, as well as an appraisal of probable dispersal patterns.
2. A detailed description of how FTHLs will be detected, and a means of documenting the effectiveness of the detection techniques. The latter objective could be accomplished through a series of "intensive surveys", similar to those used to document the accuracy of desert tortoise surveys.
3. An experimental, controlled trial, in which the initial translocation strategy is evaluated, then modified to improve the likelihood of success.

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[102] Young KV and AT Young. 2005. Indirect effects of development on the flat-tailed horned lizard. Final Report submitted to Arizona Game and Fish Department, Yuma. 11 pp.

[103] BTR, p. 94.

[104] BTR, p. 96.

P269-31, cont.

4. A detailed description of the monitoring and adaptive management measures that will be implemented after FTHLs are released.

Because the DEIS/DEIR lacks performance standards for FTHL translocation, it cannot be relied upon to show impacts to FTHL will be reduced to a level that is less than significant.

The DEIS/DEIR Fails to Establish Existing Conditions Pertaining to Raptors

P269-32

The Applicant's consultant conducted raptor migration surveys at four locations during fall 2009 and spring 2010, and at three locations during fall 2010 and spring 2011.[105] The DEIS/DEIR fails to identify the timing of migration counts (i.e., hours per day); however, it reports: "[m]igration counts were staggered to either begin shortly after sunrise or to conclude before sundown to cover the bimodal activity of diurnal bird migrants."[106] The DEIS/DEIR subsequently reports: "[t]he results of the labor-intensive fall 2009 and spring 2010 migration counts indicate that the proposed OWEF site is not part of a major migratory pathway for diurnally migrating raptor species or other migratory bird species."[107] The DEIS/DEIR lacks the scientific basis for this conclusion.

First, the DEIS/DEIR makes its conclusion despite the absence of the spring 2011 migration survey results, which the DEIS/DEIR acknowledges were not available prior to publication of the DEIS/DEIR.[108] Given temporal variability (i.e., daily, seasonal, and yearly) associated with raptor migration, the DEIS/DEIR cannot make a conclusion on the Project site's role as a migration pathway based on a single spring season of data.

P269-33

Second, the Applicant's consultant did not conduct any migration counts in the southern portion of the Project area (i.e., south of I-8). The southern portion of the Project area will contain 15 turbines over a relatively large area.[109] These turbines pose a threat to migrating raptors. Due to the numerous factors that affect bird migration counts, data can only be applied to the particular count location. As a result, abundance data from the northern portion of the Project site does not provide a reliable prediction of migratory use in the southern portion of the Project site, especially considering the nearest count station was over 1.5 miles away (and counts at this station were not conducted fall 2010 or spring 2011).[110]

P269-34

Third, numerous factors have a significant effect on migration count data. These include weather, date, year-to-year changes in the site (including food supply vegetation), changes in the migratory behavior of the species sampled, and the characteristics of the particular count site.[111] Weather, in particular, is known to contribute significant variability to migration count data.[112] Although the Applicant's consultant collected weather data during each migration count, the DEIS/DEIR fails to discuss or analyze how weather, or any other variables, influenced the data from which it bases its conclusions.[113] Although the DEIS/DEIR does not analyze the variables known to affect raptor migration, it clearly demonstrates that at least some of the variables had a significant effect on the data. Specifically, the DEIS/DEIR demonstrates significantly more raptors were detected in fall 2010 than fall 2009 (i.e., year-to-year variation), despite the allocation of more hours to the fall 2010 survey effort.[114] Although a similar difference between the two years of spring count data would be highly relevant to the analysis of existing conditions, it is precluded by the DEIS/DEIR omission of the spring 2011 count data.

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[105] BTR, p. 14.

[106] Id.

[107] BTR, p. 38.

[108] BTR, p. 14.

[109] BTR, Figure 3.

[110] BTR, Figure 7 and p. 14.

[111] Hussell DJT. 1981. The Use of Migration Counts For Monitoring Bird Population Levels. Pages 92-102 in CJ Ralph and JM Scott, editors. Estimating numbers of terrestrial birds. Studies in Avian Biology 6.

P269-34, cont.

Fourth, the behavior of migratory raptors is known to change during the course of the day.[115] For example, early in the morning, soaring birds such as vultures and hawks may remain perched until the air warms and thermals or updrafts are created.[116] Because the Applicant's migration counts were conducted during early morning and evening hours, they inherently underestimated raptor migration through the Project area.

P269-35

Fifth, researchers have concluded several years of data are required to properly characterize migration levels at any site.[117] CDFG and CEC guidelines for wind energy facilities recommend migration counts that are conducted for an 8-hour period, 4 days per week for 10 to 13 weeks to assess large bird migrations during the fall and 8 to 10 weeks during spring.[118] CDFG and CEC guidelines further recommend that count stations be distributed every two miles along an east-west axis throughout the entire project site.[119] The migration count surveys conducted for the Project failed to adhere to any of these recommendations.[120]

P269-36

Sixth, most raptors have low densities and/or low detectability.[121] Thus, low counts

P269-37

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[112] Id. *See also* Fuller MR and JA Mosher. 1981. Methods of Detecting and Counting Raptors: A Review. Pages 235-246 in CJ Ralph and JM Scott, editors. Estimating numbers of terrestrial birds. Studies in Avian Biology 6.

[113] BTR, p. 15.

[114] BTR, Table 3.

[115] Fuller MR and JA Mosher. 1981. Methods of Detecting and Counting Raptors: A Review. Pages 235-246 in CJ Ralph and JM Scott, editors. Estimating numbers of terrestrial birds. Studies in Avian Biology 6.

[116] Id.

[117] Hussell DJT. 1981. The Use of Migration Counts For Monitoring Bird Population Levels. Pages 92-102 in CJ Ralph and JM Scott, editors. Estimating numbers of terrestrial birds. Studies in Avian Biology 6.

[118] California Energy Commission and California Department of Fish and Game. 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Commission Final Report. California Energy Commission, Renewables Committee, and Energy Facilities Siting Division, and California Department of Fish and Game, Resources Management and Policy Division. CEC-700-2007-008-CMF.

[119] Id.

[120] BTR, Appendix A.

[121] Hussell DJT. 1981. The Use of Migration Counts For Monitoring Bird Population Levels. Pages 92-102 in CJ Ralph and JM Scott, editors. Estimating numbers of terrestrial birds. Studies in Avian Biology 6. *See*

cannot necessarily be attributed to low movement of raptors over the area.[122] Additionally, in the absence of applicable reference data, the DEIS/DEIR has no basis to use the migration count data to support its position that the Project area is not part of a major migratory pathway. Specifically, a mean abundance of 0.78 raptors per hour could indicate a major migratory pathway if data from known migration sites (i.e., reference sites) have recorded a mean of 0.2 raptors per hour. Reference data are fundamental to the DEIS/DEIR's conclusion. Because the DEIS/DEIR omits any reference data, it lacks the scientific foundation to conclude the Project site is outside of a major migratory pathway.

P269-37, cont.

The DEIR/DEIS Fails to Establish Existing Conditions Pertaining to Bird Use of the Project Site

The Applicant's consultant conducted 30-minute avian point counts at 21 locations throughout the Project area. The point count surveys were conducted approximately once a week from September 2009 to August 2010.[123] The DEIS/DEIR omits the time of day and weather conditions associated with each survey; however, it reports "[e]fforts were made to sequence observation times so that locations were surveyed both in the morning and in the afternoon and under varying weather conditions."[124] Data from the point count surveys were used to calculate the average number of individual birds detected per 30-minute count. Based on the point count data, the DEIS/DEIR concludes the Project site "does not support large populations of resident avian species, and many of the resident species observations, including raptor observations, were likely repeat observations of the same individual."[125] The point count data do not support this conclusion.

P269-38

First, at least some of the point count surveys were conducted under conditions that were not conducive to bird activity.[126] Research on the effect of time of day on bird activity suggests that some of the Applicant's surveys were conducted too late in the day to accurately characterize the avian community. Skirvin (1981) reported a statistically significant decline in total bird detections from the first hour to the fourth hour after sunrise.[127] In desert-scrub communities, Grue et al. (1981) detected 51% to 68% less birds between 1200 and 1400 than between 0600 and 0800.[128] Robbins (1981) concluded that bird activity may almost cease in desert habitats during the middle of the day.[129] Robbins (1981) further concluded that in general, bird abundance is inversely correlated

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also Fuller MR and JA Mosher. 1981. Methods of Detecting and Counting Raptors: A Review. Pages 235-246 in CJ Ralph and JM Scott, editors. Estimating numbers of terrestrial birds. Studies in Avian Biology 6.

[122] Fuller MR and JA Mosher. 1981. Methods of Detecting and Counting Raptors: A Review. Pages 235-246 in CJ Ralph and JM Scott, editors. Estimating numbers of terrestrial birds. Studies in Avian Biology 6.

[123] BTR, p. 15.

[124] BTR, p. 15.

[125] BTR, p. 40.

[126] BTR, p. 15.

[127] Skirvin AA. 1981. Effect of time of day and time of season on the number of observations and density estimates of breeding birds. Studies in Avian Biology No. 6:271-274.

[128] Grue CE, RP Balda, CD Johnson. 1981. Diurnal activity patterns and population estimates of breeding birds within a disturbed and undisturbed desert-scrub community. Studies in Avian Biology No. 6:287-291.

[129] Robbins CS. 1981. Effect of time of day on bird activity. Studies in Avian Biology No. 6:275-286.

with wind speed and rain.[130] Because time of day and weather conditions have a substantial effect on bird activity, and because bird detection rates are almost never perfect (even when environmental conditions are ideal), the averages (i.e., of all 30-minute counts) presented in the DEIS/DEIR do not accurately reflect the abundance of resident bird species on the Project site. Instead, it "waters" them down. This is substantiated by the Applicant's Avian and Bat Protection Plan, which reports "[s]pecies richness [of birds] was lowest (less than 10 individuals) during weeks 1, 2, 44, 46, 47, and 49-51, which corresponded with very hot daytime temperatures occurring during times of the year when migratory activity was either low or absent."[131]

Second, as the DEIS/DEIR acknowledges, point counts provide an estimate of relative abundance, not density.[132] Thus, the DEIS/DEIR lacks the basis to conclude the point count data indicate the Project site does not support "large populations" of resident avian species. A conclusion of this nature would require data on bird *density*, which were not obtained through the point count (or other) surveys. This issue is confounded by the DEIS/DEIR's failure to provide data from any reference sites. That is, without comparable reference data, the DEIS/DEIR has no basis from which to conclude an average of 5.4 per 30-minute count (for example) is indicative of a "large" or a "small" population.

P269-38, cont.

Third, the DEIS/DEIR does not specify the radius of the point counts. However, even if an unlimited radius was used (i.e., the observer recorded each bird no matter how far away it was), survey data were inherently limited to the distance the observer could see or hear. Because the Applicant's consultant did not estimate (or incorporate) a detection coefficient in its analysis of the data, it cannot use the point count data to make conclusions on the size of resident bird populations that occupy the site.

Fourth, despite the suggestion made in the DEIS/DEIR, repeat observations (of the same individual bird) among successive point counts had no influence on the DEIS/DEIR's data or analysis. The test statistic (i.e., unit of measurement) used for analysis was the average number of individual birds that were detected per 30-minute point count (a measure of abundance).[133] Indeed, because the Applicant's consultant conducted point count surveys nearly every week, repeat observations would be

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[130] Robbins CS. 1981. Effect of time of day on bird activity. Studies in Avian Biology No. 6:275-286.

[131] DEIS/DEIR, Avian and Bat Protection Plan, p. 10.

[132] BTR, p. 15. *See also* California Energy Commission and California Department of Fish and Game. 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Commission Final Report. California Energy Commission, Renewables Committee, and Energy Facilities Siting Division, and California Department of Fish and Game, Resources Management and Policy Division. CEC-700-2007-008-CMF. p. 44.

[133] Suppose four birds occupy the site during weeks 1 and 2 of the point counts. There are two possible scenarios: a) the observer records all four birds in week 1 and all four birds in week 2, resulting in an average of four birds; or b) the observer records 4 birds in week 1, but only two birds in week 2 (e.g., due to poor weather conditions), resulting in an average of three birds. Under scenario #1 the observer has accurately estimated the abundance of birds at the site, whereas under scenario #2 the observer has underestimated the abundance of birds at the site. Neither scenario results in an overestimation, as implied in the DEIS/DEIR. Whereas bird surveyors *may* double-count an individual bird during a point count, such an occurrence is rare with trained bird surveyors.

P269-38, cont.

expected, especially given most resident birds defend a territory.

P269-39

The DEIS/DEIR Incorrectly Reports the Project Site Is Not Within an Avian Migration Corridor

The DEIS/DEIR states "[t]he proposed OWEF site is not located in a known avian migration corridor (Aspen 2008; personal communication, Unitt 2007)."[134] This statement is incorrect, and it is has major implications on the adequacy of the DEIS/DEIR. Specifically, I contacted Phil Unitt, and he indicated he *absolutely did not* state that the Project area outside of a known avian migration corridor.[135] To the contrary, Mr. Unit stated the Project site is within a known migration corridor for the brant (a California Species of Special Concern), other waterbirds, and perhaps other guilds of bird species. Mr. Unit's statement is supported by the DEIS/DEIR's other reference (i.e., Aspen 2008). It reports:

> Because of the comparatively low elevation of San Diego County's mountains (lower than the San Bernardino and San Jacinto mountains to the north), many birds migrating from a winter range in western mainland Mexico to a breeding range in northern California, the Pacific Northwest, or Alaska use San Diego County as a corridor for crossing from the desert to the coastal slope. This migration happens all along the east side of San Diego County's mountains but is most concentrated in the canyons and valleys that lead from southeast to northwest, such as Grapevine Canyon and San Felipe Valley. San Felipe Valley is the most heavily used corridor (Unitt, 2007).
>
> These migration corridors are used by both land birds…and water birds. The water birds appear more likely than the land birds to follow narrow corridors…[b]asically, the line of travel is the same as Highway S2 that was built along the route of least resistance between the desert and the coastal slope. It has never been studied systematically, however, so the corridor's use by birds has been pieced together from anecdotes. Under normal conditions, birds may pass overhead unnoticed. It is when storms or strong winds force the birds to fly at lower altitudes that they can be observed.[136]

The Project site is located at the mouth of San Felipe Valley. Moreover, it is bisected by

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[134] BTR, p. 38.

[135] Phil Unitt, Curator, San Diego Natural History Museum, personal communication with Scott Cashen, 3 Oct 2011.

[136] Aspen Environmental Group. 2008. Final Environmental Impact Report/Environmental
Impact Statement and Proposed Land Use Amendment, San Diego Gas and Electric Company Application for the Sunrise Powerlink Project. SCH #2006091071. DOI Control No. FES-08-54. California Public Utility Commission and U.S. Department of Interior, Bureau of Land Management. [emphasis added].

Highway S2, the avian corridor identified by Aspen (2008) and Mr. Unitt.[137] As a result, existing information indicates the Project site is located within a major migration corridor. The Project would pose a significant threat to the birds that use the corridor. Figure 1 depicts my interpretation of the information provided by Aspen (2008) and Unitt.

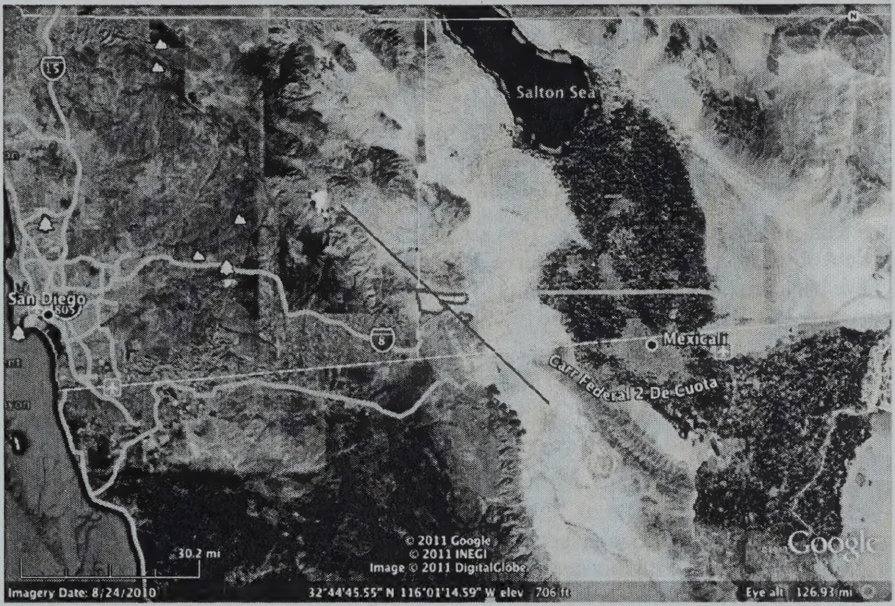
15
Salton Sea
San Diego
805
8
Mexicali
Carr Federal 2 De Cuota
30.2 mi
© 2011 Google
© 2011 INEGI
Image © 2011 DigitalGlobe
Google
Imagery Date: 8/24/2010
32°44'45.55" N 116°01'14.59" W elev 706 ft
Eye alt 126.93 mi

Figure 1. Approximate location of avian corridor (blue line) identified by Aspen (2008) and Phil Unitt. Red line depicts approximate boundaries of the Project site.

P269-39, cont.

The DEIS/DEIR Fails to Incorporate All Available Data

The Applicant's consultant conducted point count and raptor migration surveys during the spring of 2011. In addition, the Applicant's consultant used a Merlin Avian Radar System to collect data on bird movements and migration through the Project site from September 2010 to July 2011. Incredulously, the DEIS/DEIR, Avian and Bat Protection Plan, and Eagle Conservation Plan, each conclude that the Project site is not within a major bird (or bat) migration corridor, before analyzing these data.

P269-40

Most songbirds, waterfowl, shorebirds, and bats migrate at night, whereas most raptor species migrate during the day.[138] Both of these phenomena, however, are affected by

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[137] BTR, Figure 3.

[138] Kerlinger, P., and F. R. Moore, "Atmospheric Structure and Avian Migration," *Current*

P269-40, cont.

numerous variables, and they are known to vary considerably among years. Due to this variability, numerous scientific research studies have concluded multi-year studies are needed to adequately estimate a wind project's risk to birds and bats.[139]

As a result of the issues described above, analysis of the Merlin Avian Radar System and spring 2011 bird data (i.e., migration and point count) are essential to establishing baseline conditions, developing a risk assessment, formulating effective mitigation, and making an informed decision on the Project.

P269-41

Merlin Radar Data

The Applicant recently released the Merlin Radar system data that were collected for the Project. Although these data are critical to assessing Project impacts to birds, bats, and bighorn sheep, they were only made available for public review during the week preceding the comments deadline. This has precluded me from conducting a thorough review of the data. As a result, I reserve the right to submit supplemental comments once I have been provided ample opportunity to review the Applicant's Merlin Avian Radar Survey report. However, I have the following initial comments on the report:

1. The survey report presents the radar data; however, these data have little value unless they are interpreted. In addition, although the report provides numerous summary statistics, it generally fails to discuss how these statistics relate to the Project's risk to birds, bats, and bighorn sheep (e.g., the estimated number of fatalities that will occur and the impact these fatalities will have on population viability).
2. The radar report acknowledges the difficulties in comparing target passage rates among sites. With this caveat, the report concludes daytime target passage rates at the Project site were similar to those from the proposed Ripley-Westfield Wind Farm site.[140] This is important because the New York State Department of Environmental Conservation ("DEC") concluded the Ripley-Westfield Wind Farm site was an "extremely important bird/raptor migration area," and that it "ranks as the third most significant New York spring raptor migration site in terms of annual numbers of raptors moving through."[141] The DEC further concluded staff "strongly believe that the mortality expected from a completed Chautauqua [Ripley-Westfield] project will be significantly higher" than that predicted in the Draft Avian Risk Assessment.[142] Assuming the Project site has bird passage rates comparable to the Ripley-Westfield site, and assuming that risk is correlated with passage rates, there is evidence that the DEIS/DEIR has understated the Project's actual risk to birds.

Ornithology, Volume 6, 1989, pp. 109–142.

[139] Kunz TH, EB Arnett, BM Cooper, WP Erickson, RP Larkin, T Mabee, ML Morrison, MD Strickland, JM Swewczak. 2007. Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document. Journal of Wildlife Management. 71(8): 2449-2486.

[140] MERLIN Avian Radar Survey report, p. 84.

[141] *See* http://wind.netwny.com/issues/birds_and_bats/dec_response_to_avian_risk_assessment.html#

[142] Id.

3. The radar report uses the average altitude of each target (bird or bat) to generate the mean and median target heights.[143] These statistics must be interpreted with extreme caution because they do not necessarily reflect the Project's threat to birds and bats. For example, a flock of birds could spend 99% of the time above the rotor swept zone, yet experience mass mortality during the 1% of time it spends in the rotor swept zone (e.g., upon descent). Consequently, the altitudinal range of each target detected by the radar system may better reflect the Project's risk. The potentially misleading nature of report's summary statistics is reflected in the large discrepancies between the reported means and medians, and in the large standard deviations that were observed.[144]
4. One of the objectives of the pre-construction radar system was to obtain data on bighorn sheep entering the Project area. However, as the radar report acknowledges, it does not address data pertaining to the bighorn sheep objective.[145] There is no apparent justification for this omission, and the report fails to identify whether the sheep data will ever be analyzed or disclosed.

P269-41, cont.

The DEIS/DEIR Fails to Adequately Assess Project Impacts to Birds

The DEIS/DEIR repeatedly argues that the Project poses a low risk to birds and bats because the Project area does not support "large" populations of bird or bat species.[146] As discussed above, the DEIS/DEIR lacks the scientific basis to make this conclusion. Nevertheless, a "small" population does not mean there is low risk. Bird species of the southwestern United States tend to have smaller populations and smaller breeding ranges, rendering them more vulnerable to ecological stresses.[147] In fact, breeding birds in the southwestern United States are more vulnerable to ecological stresses than birds in any other region of North America (Figure 2).[148] Ecological analyses have concluded that land management decisions of American state and federal agencies (such as the BLM) will have a large impact on *global populations* of Mojave and Colorado Desert breeding bird species.[149] Thus, if one accepts the DEIS/DEIR's premise that the Project site has a small population of bird (and bat) species, the Project may kill relatively few birds, but these deaths may have very significant effects on the viability of the overall population.

P269-42

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[143] MERLIN Avian Radar Survey report, p. 11.

[144] *See* Table 4-2 of Id.

[145] Id, p. 1.

[146] BTR, p. 40.

[147] Rich TD, CJ Beardmore, H Berlanga, PJ Blancher, MSW. Bradstreet, GS Butcher, DW
Demarest, EH Dunn, WC Hunter, EE Iñigo-Elias, JA Kennedy, AM Martell, AO Panjabi, DN Pashley, KV Rosenberg, CM Rustay, JS Wendt, TC Will. 2004. Partners In Flight North American Landbird Conservation Plan. Cornell Lab or Ornithology. Ithaca, NY.

[148] CalPIF (California Partners in Flight). 2009. Version 1.0. The Desert Bird Conservation Plan: a
Strategy for Protecting and Managing Desert Habitats and Associated Birds in California. California
Partners in Flight. http://www.prbo.org/calpif/plans.html. Figure 1-2.

[149] Id.

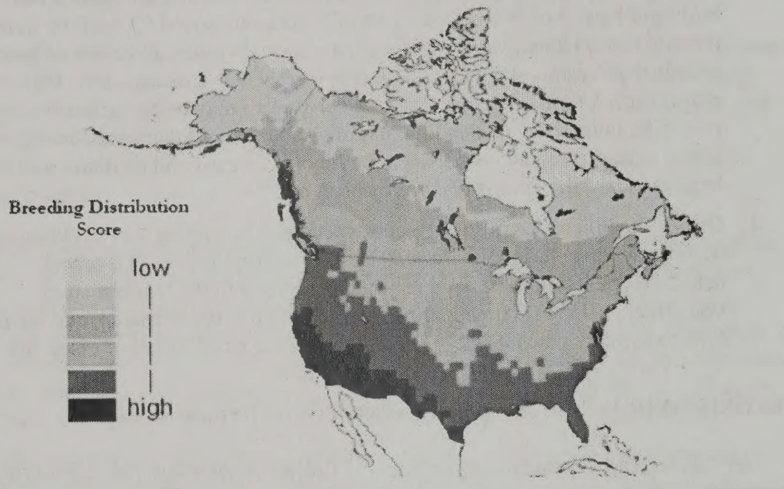

Figure 1-2. Average vulnerability among species occurring in each lat-long block during the breeding season, based on Breeding Distribution (BD) scores for 448 landbird species. Smallest range size = highest vulnerability (high BD score); largest range size = lowest vulnerability (low BD score) (Rich et al. 2004).

Figure 2. Vulnerability of North American bird species to ecological stresses.[150]

The DEIS/DEIR Lacks Adequate Mitigation for Project Impacts to Birds

According to the DEIS/DEIR, "[I]f active [bird] nests are found, no clearing would be allowed within 100 feet of the active nests until the Designated Biologist determines the nest is no longer active or if the nest fails."[151] The proposed mitigation does not ensure compliance with the Migratory Bird Treaty Act ("MBTA"), or that potentially significant Project impacts to breeding birds will be mitigated. Many breeding birds are sensitive to disturbance, which can lead to reproductive failure. Reijnen et al. (1997) concluded sound levels above 50 dBA were potentially deleterious to breeding birds, and that noise at 50 dBA had an effect on birds within an average distance of 3,280 feet (from the source of noise).[152] Consequently, the proposed 100-foot buffer is insufficient to avoid

P269-43

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[150] Id,

[151] BTR, p. 98.

[152] Reijnen R, R Foppen, G Veenbaas. 1997. Disturbance by traffic of breeding birds: evaluation of the effect and planning and managing road corridors. Biodiversity and Conservation 6: 567-581.

and minimize Project impacts to nesting birds.

The DEIS/DEIR's proposed mitigation measure also is inadequate because:

1. It does not ensure the Designated Biologist would have the minimum qualifications needed to ensure he/she has adequate knowledge of nesting ecology and can make educated decisions on the mitigation required to avoid Project impacts to nesting birds.
2. It does not identify the monitoring that would be conducted to determine the effectiveness of the proposed mitigation measure.
3. It lacks clear success criteria (i.e., measures to document the success of nests, or to evaluate the cause of nest failure).
4. The MBTA prohibits take of breeding birds, including take in the form of nest failure. The DEIS/DEIR's proposed mitigation lacks remedial actions in the event the Project results in take (e.g., nest failure).

P269-43, cont.

Avian and Bat Protection Plan

I have the following comments pertaining to the Applicant's Avian and Bat Protection Plan:

1. Page 8 references Helix (2010a) as the source of information for collision risks associated with each bird species. Helix (2010a) is not an open source document. Consequently, the Avian and Bat Protection Plan (and DEIS/DEIR) fail to disclose critical information needed to assess the validity of the Applicant's risk assessment.

P269-44

2. Page 9 reports the Project's risk to the Swainson's hawk is very low because only three individuals were observed. This conclusion was based on the fall 2009 and spring 2010 survey data.[153] By the fall of 2010, 23 Swainson's hawks had been detected during Project surveys, and additional Swainson's hawks may have been detected during the spring 2011 surveys (these data were not available prior to publication of the DEIS/DEIR). The DEIS/DEIR fails to discuss how more comprehensive survey data affect the Project's risk assessment, and whether the resource agencies have been provided up-to-date information.

P269-45

3. Page 22 proposes post-construction avian monitoring. However, the proposed monitoring methods are not consistent with the methods used for pre-construction surveys. Specifically the post-construction avian monitoring methods are considerably more conducive to detecting birds than the methods used during pre-construction surveys.[154] As a result, the proposed monitoring methods do not

P269-46

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[153] DEIR, p. 3.23-5 reports: "[t]hree additional observations were made during APC surveys in spring 2010." The DEIS/DEIR does not specify how many birds were associated with each observation; however, a total of at least 6 Swainson's hawks were detected during the reported timeframe. The DEIS/DEIR fails to justify why at least 3 birds were not reported in the Avian and Bat Protection Plan.

[154] Hussell DJT. 1981. The Use of Migration Counts For Monitoring Bird Population Levels. Pages 92-102 in CJ Ralph and JM Scott, editors. Estimating numbers of terrestrial birds. Studies in Avian Biology 6. *See*

enable accurate comparison of pre- and post-construction conditions, and they are likely to lead to a type II error (i.e., falsely suggest no Project effect to birds). This issue is confounded because the proposed post-construction monitoring methods are the most appropriate methods for bird detection.

P269-46, cont.

4. Page 23 indicates the survey interval may need to be modified (dependent on findings). However, the DEIS/DEIR lacks a mechanism for ensuring the survey interval *is* modified when appropriate. To ensure the effective implementation of adaptive management, the Avian and Bat Protection Plan must establish specific triggers for modifying the survey interval.

P269-47

5. The Avian and Bat Protection Plan proposes the establishment of a Technical Advisory Committee ("TAC"). The BLM Authorized Officer would evaluate any recommendations of the TAC, and make a decision on what measure(s) to require for implementation.[155] Whereas I generally support this strategy as mitigation, the DEIS/DEIR lacks assurance that recommendations will be implemented, monitored, and enforced. Furthermore, given the TAC would consist of experts from the various resource agencies (i.e., BLM, USFWS, and CDFG), the DEIS/DEIR lacks the rationale for leaving recommendations to the discretion of the BLM Authorized Officer (who may not be an expert in avian and bat ecology). TACs have been established for other wind resource projects. My experience has been that these TACs are not limited to resource agency personnel, but that they also are comprised of independent experts in the fields of avian and bat ecology. Additionally, my experience has been that prior to establishment of a TAC, a mechanism is created to ensure members of the TAC are not only well qualified, but that they are also unbiased. For example, the establishment of other TACs has involved stakeholder input (e.g., resource agency, Applicant, Audubon Society, public) on the personnel that should comprise the TAC. A comparable approach should be implemented for the Project.

6. Page 20 indicates the TAC should meet annually, "unless data reveal that mortality thresholds have been exceeded." It further indicates "[t]he observations made during post-construction monitoring will be reported to the TAC, which will respond with appropriate management decisions should mortalities exceed the thresholds outlined in this ABPP." Case studies of other wind project have proven that the establishment of thresholds is critical to effective adaptive management (i.e., mortality reduction). Remarkably, the Applicant's Avian and Bat Protection Plan (and DEIS/DEIR) fails to provide any thresholds, or describe a scientifically defensible process for generating them. As a result, the measures described above are unenforceable, and do not constitute mitigation for Project impacts to birds and bats.

P269-48

7. The proposed post-construction mortality monitoring methods suffer many of the same deficiencies as those proposed for golden eagle (discussed below).

P269-49

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also Fuller MR and JA Mosher. 1981. Methods of Detecting and Counting Raptors: A Review. Pages 235-246 in CJ Ralph and JM Scott, editors. Estimating numbers of terrestrial birds. Studies in Avian Biology 6.

[155] DEIS/DEIR, Avian and Bat Protection Plan, p. 19.

Mitigation proposed for the Project includes installing a Merlin radar system on top of an Advanced Biological Observation and Control Center ("ABOCC"). According to the Applicant's Avian and Bat Protection Plan, the ABOCC will be manned from sunup to sundown for the first five years of operations to specifically monitor movements of eagles and other wildlife.[156] This conflicts with the DEIS/DEIR, which states a biologist would be at the ABOCC observation tower "full time for the first three years of operation, and potentially up to an additional two years of operations, depending on the success of the monitoring."[157] I have several additional comments pertaining to the proposed mitigation measure:

1. To serve as an effective mitigation measure, the Merlin radar system appears to require the ability of a biologist to interpret results and subsequently make management decisions on the curtailment of WTGs or other O&M activities.[158] Therefore, the proposed mitigation measure is not commensurate with the duration of Project impacts (i.e., the lifespan of WTG operation). Specifically, the DEIS/DEIR lacks a process for ensuring appropriate mitigation for potentially significant impacts to birds, bats, and bighorn sheep after year three (or five). Given the uncertainty surrounding the impacts of wind energy facilities and their ability to mitigate impacts, it is unreasonable to expect a successful mitigation strategy could be developed in 3 years, and that the strategy could then be successfully applied for the remaining 27 years of Project operations.
2. Bats are nocturnal and most bird species migrate at night.[159] Whereas the Applicant proposes to operate the radar system at night, the absence of a biologist authorized to make management decisions at night appears to preclude the radar system as an effective means of avoiding and minimizing the nighttime collision risks posed by the WTGs.
3. The DEIS/DEIR suggests the biologist monitoring the Merlin radar system would be able to make recommendations on the curtailment of turbines to protect sensitive species.[160] However, the DEIS/DEIR does not specify whether the biologist would have the unequivocal authority to shut down turbines should he/she believe they pose a threat to sensitive species. According to the San Antonio Express-News, Pattern Energy touted comparable mitigation for its Gulf Wind I Wind Farm in Texas, but by the end of 2010 a shutdown had not occurred.[161]
4. The Applicant has committed to operating the Merlin radar system at the Project site during the first three (or five) years of Project operation. However, the

P269-49, cont.

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[156] Id, p. 21.

[157] DEIS/DEIR, p. 4.21-49.

[158] DEIS/DEIR, Draft Eagle Conservation Plan, Appendix C.

[159] Kerlinger, P., and F. R. Moore, "Atmospheric Structure and Avian Migration," *Current Ornithology*, Volume 6, 1989, pp. 109–142.

[160] DEIS/DEIR, Draft Avian and Bat Protection Plan, p. 26.

[161] San Antonio Express-News. 2011 Feb 27. Wind farms and deadly skies: Wind farms on Texas coast killing thousands of birds, bats each year [online]. Available at: http://www.mysanantonio.com/living_green_sa/article/Wind-farmsand-deadly-skies-1032765.php#page-1

DEIS/DEIR lacks assurance that the radar system will remain on the Project site after the three (or five) year monitoring period expires.

P269-49, cont.

The DEIS/DEIR Lacks An Adequate Assessment of Baseline Conditions Pertaining to the Golden Eagle

Focused surveys for the golden eagle appear to have been limited to a single attempt in 2010.[162] The USFWS has established *minimum* inventory and monitoring efforts that "are essential components" to avoiding and minimizing disturbance and other kinds of take of golden eagles.[163] The USFWS reports "[t]hese field efforts are the mutual responsibility of agencies authorizing activities and their permittees."[164] I concur with the USFWS that inventory data are essential to evaluating the impacts of a proposed activity and for avoiding and minimizing take of eagles—especially considering the precipitous decline of golden eagles in southwestern California. Consequently, data that conform to the minimum inventory requirements specified by the USFWS need to be provided before the DEIS/DEIR's impact assessment and proposed mitigation measures can be fully evaluated.

The DEIS/DEIR compares golden eagle use of the Project site with that of the High Winds Wind Resource Area and the Diablo Winds Wind Resource Area.[165] Based on these comparisons, the DEIS/DEIR concludes there is relatively low golden eagle use of the Project site.[166] The DEIS/DEIR's comparisons do not demonstrate relatively low golden eagle use of the Project site. Specifically, the DEIS/DEIR's comparisons are scientifically indefensible due to the numerous sources of bias that exist among studies conducted across years, distant geographic areas, and bird populations. The use of different survey techniques (including personnel) across areas that have varying environmental conditions compounds this bias. To provide a valid estimate of golden eagle use of the Project site, the DEIS/DEIR must compare use of the Project site with that of other sites within the range of the *local* eagle population.

P269-50

The DEIS/DEIR Does Not Adequately Assess Project Impacts to the Golden Eagle

I concur with the DEIS/DEIR's conclusion that "[d]rought conditions and the timing of the 2010 golden eagle nest surveys limit the utility of one year of golden eagle nest surveys for anticipating impacts to nesting eagles from the proposed OWEF."[167] As a result, and as the DEIS/DEIR has indirectly acknowledged, the survey efforts that have been conducted for the Project do not promote a reliable impact assessment or mitigation strategy. Furthermore, given the DEIS/DEIR's acknowledgement of the limitations of

P269-51

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[162] BTR, p. 16 and Appendix A.

[163] Pagel JE, DM Whittington, GT Allen. 2010 Feb. Interim Golden Eagle inventory and monitoring protocols; and other recommendations. Division of Migratory Birds, United States Fish and Wildlife Service. p. 2.

[164] Id.

[165] BTR, p. 40.

[166] Id.

[167] Draft Eagle Conservation Plan, p. 6.

the surveys, the DEIS/DEIR lacks justification for its conclusions—all of which are slanted in favor of the Applicant.

The DEIS/DEIR concludes "[c]onstruction of the proposed project would not result in direct or indirect impacts to golden eagle nests because of the distance between nest sites and the proposed project."[168] There is no scientific basis for this conclusion. Research indicates golden eagles selectively use available habitat, and that they concentrate their foraging activities in select "core" areas, which may be located a considerable distance from nest sites.[169] In a study on spatial use and habitat selection of golden eagles, Marzluff et al. (1997) concluded that there was substantial variation in home range size and habitat use among eagles, and that if such variation was ignored (by focusing on population averages), conservation strategies and biological descriptions would be inaccurate and rarely effective.[170] During the breeding season, eagles in Marzluff's study had home ranges as small as 480 acres, with 95% of the activity concentrated in core areas as small as 74 acres.[171] Home range size and behavior were a function of the types and configuration of prey habitat in the vicinity of the nest, and perhaps individual eagles.[172]

The results of this research has important implications on the DEIS/DEIR's impact analysis. In the absence of empirical data on the locations of core foraging areas, one must conclude that the Project could eliminate a substantial amount of core habitat (perhaps all) used by at least one pair of breeding eagles. The loss of core foraging habitat is likely to lead to take, as defined in the Bald and Golden Eagle Protection Act.

P269-51, cont.

The DEIS/DEIR states: "[t]he results of the extensive observation hours on the proposed OWEF site indicate that the proposed OWEF site is occasionally used by eagles for foraging, but it was not part of a regularly used foraging area in fall or spring."[173] I have no basis to accept or reject the golden eagle data that were obtained during the fall and spring bird surveys. However, the DEIS/DEIR omits discussion of eagle use of the site during the summer when foraging demands are likely highest (due to an eagle's need to feed its mate and young).

According to the DEIS/DEIR, "[b]ecause golden eagle use of the proposed OWEF site is low (0.008 observations/hour made over the 3 seasons of raptor counts), the collision risk is considered low."[174] This statement is misleading and does not accurately reflect the Project's impact to golden eagle conservation. Golden eagles are known to be highly susceptible to collision with wind turbines. Therefore, although the number of eagles that are killed might be "low", the *risk* is high. Moreover, given the low number of eagles in the Project region, the ecological *consequences* of any eagle mortalities are high due to the population's inability to withstand additional mortality. As articulated in the *Desert Bird Conservation Plan*, "[b]ird species of the southwestern United States tend to have smaller populations and smaller breeding ranges, rendering these species more vulnerable to ecological stresses.[175] This is especially true for the golden eagle, which has experienced a rapid population decline in San Diego and Imperial counties.[176]

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[168] BTR, p. 68.

[169] Marzluff JM, ST Knick, MS Vekasy, LS Schueck, TJ Zarriello. 1997. Spatial use and habitat selection of golden eagles in southwestern Idaho. The Auk 114(4):673-687.

[170] Id.

[171] Id.

[172] Id.

[173] BTR, p. 79.

[174] Id.

P269-51, cont.

Cumulative Impacts

The DEIS/DEIR concludes Project impacts to the golden eagle would be cumulatively significant because the impacts "have a potential to reduce the extent and population size of golden eagle in the cumulative impacts analysis area and because *compensation for those impacts may not be achievable*."[177] This conclusion alone has serious implications on a decision about the Project. Specifically, new provisions of the Bald and Golden Eagle Protection Act prohibit the USFWS from authorizing a project that would result in a net take of eagles. Therefore, because the Project has the potential to cause take, and because the Project may not be capable of compensating take (i.e., ensuring no-net-loss), the USFWS cannot authorize the Project.

The DEIS/DEIR concludes "[t]he magnitude of the cumulative impact to golden eagle foraging habitat is small given that there is over 250,000 acres of suitable foraging habitat within the cumulative impacts analysis area. The proposed OWEF's permanent impacts to 181 acres of habitat amounts to less than 0.1 percent of the available foraging habitat for the species within the cumulative impacts analysis area."[178] This conclusion is unsubstantiated and flawed. First, it ignores the ecological knowledge that golden eagles preferentially select habitat, and that they are limited to landscapes with specific attributes. Second, there are not 250,000 acres of suitable habitat in the cumulative impacts analysis area (i.e., the area within an approximately 20-mile radius of the Project site). The cumulative impacts analysis area considered in the DEIS/DEIR includes a substantial amount of agricultural land east of the Project site. It is well known and documented that golden eagles generally avoid agricultural areas and other areas subject to anthropogenic disturbance (e.g., towns). The past, present, and reasonably foreseeable future acreage of these areas must be excluded from consideration as potential foraging habitat. Moreover, the DEIS/DEIR's cumulative impacts assessment does not meet USFWS guidance, which states: "[t]o ensure that impacts are not concentrated in particular localities to the detriment of locally-important eagle populations, cumulative effects need to be considered at the population management level—*Service Regions* for Bald Eagles and *Bird Conservation Regions* for Golden Eagles—and, especially for

P269-52

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[175] CalPIF (California Partners in Flight). 2009. Version 1.0. The Desert Bird Conservation Plan: a
Strategy for Protecting and Managing Desert Habitats and Associated Birds in California. California
Partners in Flight. http://www.prbo.org/calpif/plans.html.

[176] Unitt PA. 2004. San Diego County Bird Atlas. Proceedings of the San Diego Society of Natural History, No. 39.

[177] DEIS/DEIR, p. 4.21-39. [emphasis added].

[178] Id.

project-specific analyses, at local area population levels (the population within the average natal dispersal distance of the nest or nests under consideration)."[179] The USFWS has established 140 miles as the area of local population effects on the golden eagle.[180] Consequently, the DEIS/DEIR's cumulative impacts analysis area is only a fraction of what the USFWS has concluded is needed to analyze both project-specific and cumulative impacts to the eagle population.

P269-52, cont.

Eagle Conservation Plan

The Applicant's Draft Golden Eagle Conservation Plan ("ECP") provides a qualitative assessment of various factors affecting the Project's risk to golden eagles.[181] The risk of several of these factors has not been accurately reported or substantiated. For example, the ECP identifies "turbine height" as being a low risk factor even though 15 of the 22 eagle observations were within the rotor swept area of the turbines that will be located on the Project site. For several other factors, the ECP indicates that scientific evidence reports "mixed findings" (in relation to the factor's contribution to risk), yet the ECP universally, and without justification, concludes that each factor's contribution to the Project-specific risk is "low." This clearly demonstrates bias and the failure to honestly disclose the Project's risk to golden eagles.

P269-53

Table 9 of the ECP provides a list of other wind energy facilities, and the golden eagle fatalities that have been observed at those facilities.[182] The ECP identifies a total of five golden eagle fatalities across the dozens of facilities listed in the table. The ECP grossly misrepresents the facts. Due to their foraging behavior, golden eagles are frequently killed by wind turbines. Post-construction mortality monitoring studies have estimated that 40 to 116 golden eagles are killed annually in the Altamont Pass Wind Resource Area alone.[183] Whereas the estimated number of eagle deaths is anticipated to be much lower at the Project site, the ECP cannot mislead decision makers and the public into believing wind facilities pose little threat to eagles.

The DEIS/DEIR Does Not Provide Adequate Mitigation for Potentially Significant Project Impacts to the Golden Eagle

I have the following comments pertaining to the DEIS/DEIR's proposed mitigation for potentially significant impacts to the golden eagle.

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[179] Pagel JE, DM Whittington, GT Allen. 2010 Feb. Interim Golden Eagle inventory and monitoring protocols; and other recommendations. Division of Migratory Birds, United States Fish and Wildlife Service.

[180] US Fish and Wildlife Service, Division of Migratory Bird Management. 2009. Final Environmental Assessment, Proposal to Permit Take. Provided Under the Bald and Golden Eagle Protection Act. Washington: Dept. of Interior.

[181] Draft Golden Eagle Conservation Plan, Table 8.

[182] Id, p. 19.

[183] Arnett, E. B., D. B. Inkley, D. H. Johnson, R. P. Larkin, S. Manes, A. M. Manville, J. R. Mason, M. L. Morrison, M. D. Strickland, and R. Thresher. 2007. Impacts of wind energy facilities on wildlife and wildlife habitat. Wildlife Society Technical Review 07-2. The Wildlife Society, Bethesda, Maryland, USA. *See also* Smallwood KS and C Thelander. 2008. Bird Mortality in the Altamont Pass Wind Resource Area, California. Journal Wildlife Management. 72(1):215-223.

P269-54

1. To comply with the Bald and Golden Eagle Protection Act ("Eagle Act"), the DEIS/DEIR must make it explicitly clear that the Project will not be permitted unless it receives an incidental take permit from the USFWS, and/or concurrence from the USFWS that it is in compliance with the Eagle Act.

P269-55

2. The DEIS/DEIR concludes "[d]egradation of habitat would indirectly affect golden eagle foraging if it resulted in …changes in prey abundance or species assemblages."[184] The DEIS/DEIR lacks any mitigation or monitoring for this potentially significant impact.
3. To compensate for Project-related mortality to golden eagles during the first five years of operation, the Applicant has committed to providing $30,000 for the purpose of retrofitting lethal power poles in the region.[185] The proposed fee does not appear to be commensurate with USFWS guidelines for compensatory mitigation.[186] Furthermore, the DEIS/DEIR lacks compensatory mitigation for the Project's direct and indirect impacts to golden eagle foraging habitat. These impacts may result in additional take of golden eagles that is not mitigated by the DEIS/DEIR.

P269-56

4. The adaptive management measures proposed in the ECP (and DEIS/DEIR) lack a clear enforcement mechanism that ensures they will be implemented, and not left to the discretion of the Applicant. Similarly, the ECP and DEIS/DEIR lack explicit "triggers" to initiate adaptive management (e.g., remedial actions to reduce mortality). The lack of explicit triggers (e.g., realized mortality that exceeds the predicted mortality by 50%) makes the proposed adaptive management strategy unenforceable. As a result, specific triggers *must* be established before the Project begins operation.

P269-57

5. The ECP states: "[t]hese ACP's [Advanced Conservation Practices] and this research are likely not feasible or practical at all facilities, but given the size of this facility and other factors, there are opportunities to learn and test hypotheses regarding the effectiveness of such equipment in reducing mortality."[187] I have two primary concerns related to this statement: (1) for decision makers and the public to be able to evaluate the proposed mitigation strategy, the ECP must establish the ACPs and research that *are* feasible for the Project; and (2) the ECP fails to specify any of the hypotheses that will be tested. In summary, adaptive management is an *iterative* feedback process in which management actions are guided by site-specific monitoring results, new scientific information, stakeholder input, and the scientific method.[188] Although adaptive management is a feasible

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[184] BTR, p. 69.

[185] Draft Golden Eagle Conservation Plan, p. 26.

[186] U.S. Fish and Wildlife Service. 2011 Jan. Draft Eagle Conservation Plan Guidance, Appendix F. Available at: http://www.fws.gov/windenergy/eagle_guidance.html.

[187] Draft Golden Eagle Conservation Plan, p. 24.

[188] *See* Williams, B.K., R.C. Szaro, and C.D. Shapiro. 2009 Adaptive Management: The U.S. Department of the Interior Technical Guide. Adaptive Management Working Group, U.S. Department of the Interior, Washington, DC.

P269-57, cont.

mitigation strategy that would reduce Project impacts on birds and bats, the ECP's failure to establish hypotheses, and the Applicant's proposal for only three years of post-construction monitoring, make the adaptive management strategy proposed in the ECP (and DEIS/DEIR) ineffective and not a form of mitigation.

P269-58

6. The ECP indicates the Applicant will monitor active golden eagle nests to track the breeding success of resident golden eagles and to evaluate the effectiveness of the mitigation measures that have been applied.[189] The ECP fails to provide the methods that will be used (e.g., statistical procedures) to lead to reliable conclusions about the effectiveness of the mitigation. Whereas I concur that post-construction monitoring is necessary, the Applicant's failure to collect adequate baseline data preclude this from being a reliable mitigation strategy. Specifically, the surveys proposed in the ECP need to occur *before* the Project the environmental review phase is completed, not simply after it.

P269-59

7. The ECP proposes a final monitoring report within six months of completing the proposed three years of monitoring. However, the purpose of the monitoring is to determine whether additional monitoring and adaptive management are required. The proposed timeline for reporting inherently creates a gap in monitoring and adaptive management should data from first three years indicate these actions are needed.

The DEIS/DEIR Does Not Adequately Address Project Impacts to the Burrowing Owl

Baseline Conditions

P269-60

The entire Project site contains suitable burrowing habitat.[190] As a result, the DEIS/DEIR states that the Applicant's consultant conducted burrowing owl surveys that adhered to California Burrowing Owl Consortium ("CBOC") survey protocols.[191] Because the DEIS/DEIR does not provide a burrow map or identify the Phase III survey areas, I am unable to evaluate the validity of this statement.

In addition to the protocol surveys, the Applicant's consultant conducted follow-up breeding season surveys. According to the DEIS/DEIR, "[t]he purpose of the follow-up breeding season surveys was to search for burrowing owls and owl burrows in areas of the project site that were not extensively surveyed during other surveys conducted by HELIX during the spring and summer 2010 (i.e., rare plant surveys, FTHL survey, or APC/migration surveys)."[192] The DEIS/DEIR fails to a) specify the areas (including acreage) of the Project site that were subject to follow-up surveys (i.e., the areas that were not extensively surveyed during "other" surveys); and b) indicate whether the follow-up surveys adhered to CBOC protocols.

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[189] Draft Golden Eagle Conservation Plan, p. 30.

[190] BTR, p. 16.

[191] Id.

[192] BTR, p. 17.

The Project footprint was redesigned after the breeding season burrowing owl surveys were completed.[193] According to the DEIS/DEIR, the "new areas… were surveyed for burrowing owl burrows as part of the fall 2010 special status plant surveys (Figure 8). Burrows that were mapped during the fall 2010 special status plant surveys *will be* surveyed during the 2011 burrowing owl breeding season and a report will be prepared to summarize the methods and results of these surveys."[194] Similar to my discussion of the "follow-up" burrowing owl surveys, the DEIS/DEIR fails to a) specify the areas (including acreage) of the Project site that were not subject to the 2010 protocol surveys; and b) indicate whether the 2011 surveys adhered to CBOC protocols.

As a result of the issued described above, the DEIS/DEIR lacks the information needed to evaluate the Applicant's burrowing owl survey efforts, and consequently, the validity of the results presented in the DEIS/DEIR. In addition, because the 2011 burrowing owl survey results and methods are not presented in the DEIS/DEIR, the DEIS/DEIR establishes that it lacks complete data on burrowing owl abundance and distribution throughout the Project site. Data on burrowing owls throughout the entire Project site (and associated buffer areas) is required to adequately disclose Project impacts, and to evaluate the mitigation proposed in the DEIS/DEIR. Moreover, the DEIS/DEIR lacks a mechanism for a) disclosing the results of the 2011 burrowing owl surveys to the public; b) reassessing Project impacts once 2011 survey data are available; or c) reformulating mitigation that reflects the 2011 survey data.

P269-60, cont.

Impacts

Burrowing owls in California have been declining across their range. This includes Imperial County, which historically has been considered the "stronghold" of the State's population. The Project would contribute to the further decline of the State's burrowing owl population. Burrowing owls are highly susceptible to collision with wind turbines, and they have experienced high rates of morality at other wind energy sites.[195] Incredibly, the DEIS/DEIR fails to disclose or analyze the threat the Project poses to burrowing owls, or discuss the relative significance of Project impacts in maintaining a viable burrowing owl population in the region.

P269-61

Mitigation

Research indicates the micro-site characteristics of individual WTGs are a key factor in fatalities to burrowing owls (i.e., from collision with WTGs).[196] For example, a model that incorporated turbine and landscape attributes correctly predicted 71% of burrowing

P269-62

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[193] Id.

[194] Id. [emphasis added].

[195] Smallwood KS, L Neher, DA Bell. 2009. Map-Based Repowering and Reorganization of a Wind Resource Area to Minimize Burrowing Owl and Other Bird Fatalities. Energies. 2: 915-943.

[196] Id, p. 4-4-9. *See also* Smallwood KS, L Neher, DA Bell. 2009. Map-Based Repowering and Reorganization of a Wind Resource Area to Minimize Burrowing Owl and Other Bird Fatalities. Energies. 2: 915-943.

owl fatalities in the Altamont Pass Wind Resource Area ("APWRA").[197] In their report for the California Energy Commission, Smallwood and Thelander (2004) hypothesized that micrositing of turbines could contribute more to reducing avian fatality than any of the 16 other mitigation measures evaluated.[198] Although studies have shown that micrositing can dramatically reduce impacts to burrowing owls, the DEIS/DEIR provides no indication that the Applicant considered micro-site characteristics associated with burrowing owls in designing the layout of individual WTGs. Moreover, the Applicant could not have designed the Project to avoid and minimize impacts to burrowing owls because the DEIS/DEIR was prepared before burrowing owl surveys had been completed across the entire Project site. As a result, the DEIS/DEIR demonstrates that the Project has not been designed to avoid and minimize impacts to the burrowing owl. **P269-62, cont.**

The DEIS/DEIR concludes Project operations and maintenance ("O&M") activities would have potentially significant impacts on burrowing owls.[199] The DEIS/DEIR, however, concludes impacts "would be reduced to a level below significance by the requirement to conduct a pre-construction burrowing owl survey in accordance with MM 20 if O&M activities have the potential to disturb habitat outside of the approved permanent project footprint."[200] The DEIS/DEIR lacks the basis for this conclusion. Specifically, the referenced mitigation measure (i.e., MM 20) does not: **P269-63**

a. specify the need for pre-construction burrowing owl surveys prior to O&M activities; and
b. require any compensation (i.e., provision of artificial burrows and preservation of foraging habitat) for O&M activities that result in impacts to burrowing owls or their habitat.

The DEIS/DEIR requires protocol burrowing owl surveys be completed across the entire Project site prior to the start of construction. As discussed above, the DEIS/DEIR lacks a mechanism for disclosing the results of the surveys to the public, reassessing Project impacts once the surveys have been completed; or c) reformulating mitigation to reflect the survey data. Moreover, the DEIS/DEIR fails to demonstrate the proposed measure is feasible given civil work (i.e., roads, underground electrical, foundations) for Phase I of the Project is expected to begin in the 4th quarter of 2011.

Mitigation imposed by the DEIS/DEIR includes having the Applicant mitigate the loss of 26 acres of burrowing owl foraging habitat through a combination of off-site habitat compensation, on-site revegetation of temporary impact areas, and/or on-site or off-site restoration of disturbed habitat.[201] The proposed mitigation is inadequate for the **P269-64** following reasons:

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[197] Smallwood KS, L Neher, DA Bell. 2009. Map-Based Repowering and Reorganization of a Wind Resource Area to Minimize Burrowing Owl and Other Bird Fatalities. Energies. 2: 915-943.

[198] Smallwood KS, C Thelander. 2004. Developing Methods to Reduce Bird Mortality in the Altamont Pass Wind Resource Area. Prepared by BioResource Consultants for the California Energy Commission Public Interest Energy Research (PIER) Program, Report #500-04-052.

[199] BTR, p. 76.

[200] Id.

[201] BTR, p. 97.

1. CBOC guidelines (which have been adopted by the CDFG and Imperial County), clearly dictate the need to provide compensation that is based on the number of burrowing owl pairs (or unpaired resident single birds) that are impacted by the project.[202] The proposal to provide 26 acres of foraging habitat fails to incorporate mitigation for additional owls that are detected during pre-construction surveys, or for owls present in portions of the Project area that had not been surveyed prior to preparation of the DEIS/DEIR.
2. The proposed mitigation measure allows the Applicant to compensate for Project impacts to burrowing owl habitat by revegetating habitat that is impacted by the Project. This is clearly not an effective conservation strategy because it promotes the degradation and net loss of burrowing owl habitat. Whereas I support the revegetation of temporary impact areas, revegetation efforts do not mitigate the Project's contribution to permanent impacts to burrowing owls and their habitat (including direct losses, and due to the abandonment of occupied territories).
3. The proposal to provide 26 acres of foraging habitat is not consistent with CDFG and CBOC guidelines. The guidelines allow a *minimum* of 6.5 acres only if the mitigation can be accomplished on-site, and under specific circumstances (e.g., when the foraging habitat is contiguous with the occupied burrow and not subject to indirect impacts). For off-site mitigation, the CDFG and CBOC guidelines recommend the acquisition and preservation of 9.75 to 19.5 acres per pair or single bird, depending on whether the acquired habitat and surrounding lands are occupied by burrowing owls.[203]
4. The DEIS/DEIR fails to impose any of the other mitigation measures recommended by the CDFG and CBOC. These include the provision of artificial burrows for owls that are evicted from their burrows, and the implementation of a monitoring plan with success criteria to evaluate the success of the mitigation program.
5. The DEIS/DEIR lacks a mechanism for ensuring compensation lands are preserved in perpetuity (e.g., through a conservation easement) and managed to promote the conservation of burrowing owls.

P269-64, cont.

The DEIS/DEIR Fails to Provide a Reliable Description of Existing Conditions Pertaining to Bats

The Applicant's consultant, Dr. Rahn, conducted surveys for bat species using AnaBat™ SD1 Bat Detectors and thermal imaging cameras.[204] In addition, AnaBat monitors were installed on the two meteorological towers located on the Project site.[205]

P269-65

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[202] The California Burrowing Owl Consortium. 1993. Burrowing Owl Survey Protocol and Mitigation Guidelines. Available online at: http://www.dfg.ca.gov/wildlife/species/docs/boconsortium.pdf.

[203] Id.

[204] BTR, 18.

[205] Id.

According to the DEIS/DEIR, "[a]reas with high bat activity were surveyed for an additional 10 to 15 minutes, identifying important areas of activity (e.g. foraging, drinking water, and potential roost sites)."[206] This aspect of the survey methods is troubling because: 1) the DEIS/DEIR does not identify the areas subject to an additional 10 to 15 minutes of surveying; 2) according to the DEIS/DEIR, there were no instances of high bat activity; and 3) according to the DEIS/DEIR, the Project site lacks water, abundant forage, and roost sites.[207] This leads me to the conclusion that the DEIS/DEIR has either a) not accurately reported the survey methods, or b) not accurately reported the presence of important bat areas on the Project site.

Based on the survey results, the DEIS/DEIR concludes there is very low bat use of the Project site.[208] The DEIS/DEIR lacks the data to make this conclusion.

First, the methods that were used during the surveys were not appropriate for detecting the presence of several special-status bat that have the potential to occur on the Project site.[209] CEC and CDFG wind energy guidance specifically directs project proponents to review the survey techniques recommended by the Western Bat Working Group.[210] Table 1 summarizes the Western Bat Working Group's conclusions pertaining to acoustical monitoring and visual surveys (i.e., the two techniques used to survey the Project site) in relation to the special-status bat species that may occur on the Project site.[211]

P269-65, cont.

Table 1. Western Bat Working Group's conclusions on the effectiveness of acoustic and visual survey techniques for detection of special-status bat species that may occur on the Project site.[212]

Species	Effectiveness of Acoustic + Visual Techniques
Pallid bat	Preferred or highly effective
Townsend's big-eared bat	*Presents serious challenges*
Western mastiff bat	Preferred or highly effective
California leaf-nosed bat	*Presents serious challenges*
Small-footed myotis	*Presents serious challenges*
Long-eared myotis	Effective in most habitats
Fringed myotis	Effective in most habitats
Cave myotis	Effective in *some* habitats

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[206] BTR, p, 18.

[207] BTR, p. 44.

[208] DEIS/DEIR, Draft Avian and Bat Protection Plan, p. 14.

[209] *See* BTR, Appendix E.

[210] California Energy Commission and California Department of Fish and Game. 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Commission Final Report. California Energy Commission, Renewables Committee, and Energy Facilities Siting Division, and California Department of Fish and Game, Resources Management and Policy Division. CEC-700-2007-008-CMF. p. 56.

[211] BTR, Appendix E.

[212] Western Bat Working Group. Survey Matrix. Available at: http://www.wbwg.org/speciesinfo/survey_matrix/survey_matrix.html.

Yuma myotis	Preferred or highly effective

The Western Bat Working Group's ("WBWG") evaluations are supported by the Applicant's survey data: the WBWG ranks acoustic and visual surveys as being "highly effective" (the highest ranking of "1") for the five species that were detected during Project surveys, and generally less than effective (rank 3 or 4) for the potentially occurring species that were not detected (and for which other techniques are recommended).[213]

Second, a single year of sub-sampling is inadequate to capture daily, seasonal or yearly variability at the site.[4] As a result, the DEIS/DEIR fails to provide a reliable estimate of bat distribution, abundance, or composition within the Project site. This is supported by numerous research studies, which urge longer-term evaluations to elucidate patterns associated with risk and fatalities at wind facilities.[214]

Third, Anabat detectors have an extremely limited range (approximately 5 to 100 meters depending on the volume and frequency of the species making the calls).[215] Consequently, they are only capable of detecting bats within a relatively short distance. This has implications on the appropriateness of the sampling scheme, and more importantly, interpretation of the survey results. Placing detectors at two towers does not representatively sample the composition, abundance, and distribution of bats across the 12,435-acre Project site, and given the range limitations of AnaBat detectors, Dr. Rahn sampled only a small fraction of the Project site. Consequently, the DEIS/DEIR does not have the basis to conclude the majority of the Project site lacked bat activity, especially because the majority of the Project site was outside of the technological range of the AnaBat detectors and thermal imaging cameras.[216] This conclusion is supported by scientific data analysis (albeit preliminary), which suggests acoustical monitoring at two (or even three) towers may fail to adequately represent bat activity on a given site.[217]

P269-65, cont.

Similarly, the DEIS/DEIR has no basis to conclude 31 calls (for example) is "low" without first standardizing the data per unit of effort (i.e., hours of AnaBat use). Assuming each AnaBat detector had an effective range of 100 meters, and that three AnaBat detectors were in use at all times, they would have been capable of recording bat calls across 23.2 acres of the site at any given point in time. This constitutes a sample of 0.0019 of the entire project area at any given point in time. Detection of 31 calls across 23.2 acres potentially translates into thousands of bats occurring across the Project site.

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[213] Id.

[214] Arnett, E. B., D. B. Inkley, D. H. Johnson, R. P. Larkin, S. Manes, A. M. Manville, J. R. Mason, M. L. Morrison, M. D. Strickland, and R. Thresher. 2007. Impacts of wind energy facilities on wildlife and wildlife habitat. Wildlife Society Technical Review 07-2. The Wildlife Society, Bethesda, Maryland, USA.

[215] Anabat & Bat Training. 2011. Frequently Asked Questions (FAQs). Available at: http://www.anabattraining.co.uk/technical-support/frequently-asked-questions/

[216] Id. *See also* DEIS/DEIR, Draft Avian and Bat Protection Plan, p. 14.

[217] Kunz TH, EB Arnett, BM Cooper, WP Erickson, RP Larkin, T Mabee, ML Morrison, MD Strickland, JM Swewczak. 2007. Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document. Journal of Wildlife Management. 71(8): 2449-2486.

Whereas the calculations used in the example above are crude, they demonstrate the flaws in the interpretation of the survey data presented in the DEIS/DEIR.

Fourth, the DEIS/DEIR improperly uses the Anabat data to conclude a "low number of bats" use the Project site.[218] Acoustic monitors such as the AnaBat do not provide data that can be used to determine the number of individual bats; they can only be used to record events of detection.[219] These records of detection (or recorded activity levels) are not necessarily proportional to abundance because of numerous, well documented, reasons.[220]

P269-65, cont.

As a result of the issues described above, the DEIS/DEIR fails to establish accurate baseline conditions for sensitive bat species that may occur on the Project site, and consequently, the information needed to accurately assess Project impacts, formulate effective mitigation, and implement an appropriate adaptive management plan.

Impacts

The DEIS/DEIR does not fully disclose the Project's potentially significant impacts on bats. Bats are long-lived mammals with few predators and low reproductive rates.[221] As a result, sustained, high fatality rates from collisions with wind turbines could have potentially significant impacts to bat *populations* because population growth is slow.[222] The population-level impacts are especially significant given the cumulative development of wind energy and other projects in the region.

P269-66

Mitigation

The DEIS/DEIR states that the Project site lacks any form of standing water.[223] This appears to contravene common sense, as the DEIS/DEIR acknowledges the presence of numerous washes throughout the Project site. Washes on the Project site demonstrate water is present at least occasionally. Desert wash communities support a high abundance of birds and bats. Strands of wind turbines located along Project washes (such as the majority of the turbines within Site Two) are likely to have a disproportionately

P269-67

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[218] BTR, p. 45.

[219] Kunz TH, EB Arnett, BM Cooper, WP Erickson, RP Larkin, T Mabee, ML Morrison, MD Strickland, JM Swewczak. 2007. Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document. Journal of Wildlife Management. 71(8): 2449-2486.

[220] Id.

[221] Kunz, T. H., "Roosting Ecology of Bats," in T. H. Kunz (ed.), *Ecology of Bats*, Plenum Press, New York, 1982, pp. 1–55.

[222] Racey, P. A., and A. C. Entwistle, "Life History and Reproductive Strategies of Bats," in E. G. Crighton and P. H. Krutzsch (eds.), *Reproductive Biology of Bats*, Academic Press, New York, 2000, pp. 363–414.

[223] BTR, p. 70.

high impact on birds and bats. Incredibly, the DEIS/DEIR lacks any evidence that Project WTGs were micro-sited to minimize these impacts.

P269-67, cont.

Post-construction Monitoring and Mitigation Protocols

The DEIS/DEIR's proposed mitigation includes post-construction mortality monitoring that would begin no later than three months after the Project commences operation. This mortality monitoring would be conducted at a subset of turbines (~30%). The proposed measure does not adequately mitigate potentially significant Project impacts to bats. Significant bat mortality has the potential to occur immediately after the Project begins operation. Although it has not been tested, the first months of operation at a facility may be the most crucial for bat and bird behavior modification. Consequently, the DEIS/DEIR lacks the rationale for postponing fatality monitoring, which must begin at the onset of turbine operation.

Subsampling 30% of the turbines is not a reliable means of evaluating Project impacts to bats. Although there is a general lack of bat fatality monitoring protocols, research has indicated subsampling is only appropriate after all turbines have been searched, and the data have been analyzed to determine inter-turbine variance.[224]

P269-68

Finally, the Applicant's proposed methods for estimating scavenger removal rate include placing 20 specimens on the ground to determine a rate of removal. This type of removal trial could result in "swamping," whereby there are more specimens put out for trials than are usually available under "normal" conditions.[225] Because it underestimates scavenger removal rates, "swamping" can result in an underestimate of total fatalities. As a result, the DEIS/DEIR has not provided a reliable monitoring program. Without a reliable monitoring program, the DEIS/DEIR lacks the measures to ensure impacts to birds and bats (including special-status species) will be avoided, minimized, and mitigated.

Peninsular Bighorn Sheep

The Project has the potential to cause significant impacts to the Peninsular bighorn sheep ("PBHS") inhabiting the southeastern portion of the Peninsular ranges in western Imperial County and environs. The DEIS/DEIR and associated documents fail to adequately disclose or discuss the potential impacts in the context of their significance to the local population of PBHS, as well as to the viability and persistence of PBHS in the Peninsular ranges in general.

P269-69

My critique of the baseline information and analysis of impacts attributed to PBHS centers largely on DEIS/DEIR's failure to address three specific impacts: (1) impacts to sheep movement corridors among areas occupied (or habitat that may be suitable, but otherwise unoccupied) by PBHS; (2) impacts to PBHS through the loss of valuable forage in low-lying areas; and (3) the significance of the loss of up to 13,000 acres of habitat that likely is used occasionally, if not more frequently, by PBHS. **P269-69, cont.**

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[224] Piorkowski, M.P. and T.J. O'Connell. 2010. Spatial pattern of summer bat mortality from collisions with wind turbines in mixed-grass prairie. American Midland Naturalist. 164:260-269.

[225] Smallwood, K.S., D.A. Bell, S.A. Snyder and J.E. DiDonato. 2010. Novel scavenger removal trials increase wind turbine-caused avian fatality estimates. *Journal of Wildlife Management*. 74(4): 1089-1097.

I. The DEIS/DEIR Fails to Identify or Mitigate Impacts to Movement Corridors

P269-70

The Project will impact approximately 13,000 acres of land administered primarily by the BLM. The Applicant should be commended for following the recommendations that Dr. Walter Boyce made to reduce the potential impacts of the Project on PBHS.[226] According to information contained in the DEIS/DEIR,

> "Boyce (2010) recommended the redesign of the preliminary Project design to remove turbines from the southwest corner of Site 1 because of the documented sightings of PBHS in the I-8 Island (i.e., the area between the eastbound and westbound lanes of I-8, the northern portion of which is in the proposed OWEF site), because the area is rated high in the habitat suitability analysis by Rubin et al. (2009), and due to the fact the bighorn sheep use the Devil's Canyon crossing under I-8 as a means to access the I-8 Island. The Project proponent revised the Project site plan to eliminate the 14 wind turbines originally proposed in the southwest corner of Site 1."[227]

Despite these alterations to the Project, there remains reason for concern about Project impacts to the viability and persistence of PBHS at the level of both the local population and the metapopulation.

The federal recovery plan for the PBHS states "the ability of bighorn sheep to move freely throughout *all parts of the range is critical to recovery*."[228] Nevertheless, and despite the presence of federally designated "Essential Habitat" on the Project site, the DEIS/DEIR concludes that there will be no impact to intermountain movements by PBHS.[229] The DEIS/DEIR generally lacks support for this conclusion, other than providing statements that:

> "(1) the known movement corridor between the Coyote Mountains is along Sweeney Pass (approximately 6 miles northwest of site 1); (2) the known movement corridor between Carrizo Gorge and the I-8 Island is approximately 2 miles to the south of the proposed OWEF site; (3) the Proposed Action was designed to remove proposed OWEF features originally designed in the southwest portion of Site 1 and to move

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[226] Boyce, W. 2011. Ocotillo Express Project and bighorn sheep: impacts and recommendations. Unpublished manuscript. (Not seen; cited on page 8-20 of the draft EIS/EIR).

[227] Rubin, E. S., C. J. Stermer, W. M. Boyce, and S. G. Torres. 2009. Assessment of predictive habitat models for bighorn sheep in California's Peninsular ranges. Journal of Wildlife Management 73:859-869. *See also* BTR, p. 47.

[228] U.S. Fish and Wildlife Service. 2000. Recovery plan for bighorn sheep in the Peninsular ranges, California. p. 77. [emphasis added].

[229] Draft EIS/EIR, Page 4.21-9.

> proposed OWEF features further from Devil's Canyon; and (4) the OWEF site will not be fenced, and post-construction activity levels are expected to be similar to the pre-construction activity levels."[230]

The DEIS/DEIR further asserts that, "[t]he Proposed Action would not result in additional habitat fragmentation of suitable PBHS habitat because the proposed OWEF site is not currently occupied."[231] The arguments that there will be no impact to intermountain movements by PBS cannot be supported on the basis of these statements alone. The arguments are, thus, based on speculation that there would not be impacts to intermountain movements. As a result, the DEIS/DEIR does not adequately analyze the potential that PBHS could use the Project site to move from areas with more "stereotypical bighorn sheep habitat" to other similar areas either north or south of the Project site.

P269-70, cont.

PBHS occupy a number of areas surrounding the Project site including (a) the area known as the Coyote Mountains immediately west of the Project site and north of Interstate Highway 8, which supports a population of between 45 and 60 individuals;[232] (b) the Fish Creek Mountains immediately north of the Project site that are occupied by PBHS on at least a seasonal basis;[233,234] (c) the Sierra Juarez[235,236,237] located immediately south of the Jacumba Mountains near the Project site; (d) the Sierra Cucapa[238,239,240], located immediately southeast of the Project site; and (e) a portion of the Jacumba Mountains immediately south of Interstate 8.[241] In addition, as disclosed in the DEIS/DEIR, PBHS use the Interstate Highway 8 "island" between the northbound (westbound) and southbound (eastbound) lanes of that heavily traveled route.[242]

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[230] Draft EIS/EIR, Page 4.21-9.

[231] Draft EIS/EIR, Page 4.21-9.

[232] R. Botta, California Department of Fish and Game, personal communication to V. Bleich on 24 March 2010.

[233] R. Botta, California Department of Fish and Game, personal communication to V. Bleich on 24 March 2010.

[234] M. Jorgensen, California Department of Parks and Recreation (retired), personal communication to V. Bleich on 23 March 2010.

[235] DeForge, J. R., S. D. Ostermann, D. E. Toweill, P. E. Cyrog, and E. M. Barrett. 1993. Helicopter survey of Peninsular bighorn sheep in northern Baja California. Desert Bighorn Council Transactions 37:24-28.

[236] Lee, R. 2011. Report on the recent survey of bighorn sheep in Baja California. Available at: http://www.huntingreport.com/temp_Report_on_the_recent_survey_of_bighorn_sheep_in_Baja_California_June_2011.cfm

[237] Conservation Biology Institute and Terra Peninsular. 2010. Maintaining a landscape linkage for Peninsular bighorn sheep. Unpublished report prepared for The Nature Conservancy.

[238] DeForge, J. R., S. D. Ostermann, D. E. Toweill, P. E. Cyrog, and E. M. Barrett. 1993. Helicopter survey of Peninsular bighorn sheep in northern Baja California. Desert Bighorn Council Transactions 37:24-28.

[239] Lee, R. 2011. Report on the recent survey of bighorn sheep in Baja California. Available at: http://www.huntingreport.com/temp_Report_on_the_recent_survey_of_bighorn_sheep_in_Baja_California_June_2011.cfm

[240] Conservation Biology Institute and Terra Peninsular. 2010. Maintaining a landscape linkage for Peninsular bighorn sheep. Unpublished report prepared for The Nature Conservancy.

[241] R. Botta, California Department of Fish and Game, personal communication to V. Bleich on 24 March 2010.

[242] Draft EIS/EIR, Page 4.21-10.

Collectively, these mountainous areas have been designated as the Carrizo Mountains/Tierra Blanca Mountains/Coyote Mountains Recovery Area[243] (henceforth referred to as the "CTCRA") in the Recovery Plan for PBHS in the Peninsular Ranges.[244] Given PBHS occupy the mountains surrounding the Project site, and given the knowledge that PBHS exhibit intermountain movement, the Project site could function as an important movement corridor in the CTCRA Recovery Area. Dismissal of that potential based on the limited evidence provided in the DEIS/DEIR is premature. Moreover, it is recognized that "the most serious threat to the functionality of [this] landscape linkage is habitat loss and fragmentation…" and disruption or blockage of even *potential* movement corridors could have international implications on conservation.[245] Further, the most imminent threats to potential linkages between or among areas of stereotypical bighorn sheep habitat are reported to be "the renewable energy Projects proposed for … both California and Baja California".[246]

P269-70, cont.

The Recovery Plan for Bighorn Sheep in the Peninsular Ranges involves re-establishment of connectivity with populations of bighorn sheep south of the US-Mexico border.[247] That goal is consistent with the *Las Californias Binational Conservation Initiative*, which strives to protect ecological integrity and connectivity for the full complement of natural communities, processes, and wide-ranging species, including bighorn sheep, in the Las Californias region.[248] The *Las Californias Binational Conservation Initiative* has been "[a]dopted by the U.S. Bureau of Land Management, California State Parks, and the California Biodiversity Council, among others, as part of their agency planning visions."[249]

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[243] U.S. Fish and Wildlife Service. 2000. Recovery plan for bighorn sheep in the Peninsular ranges, California.

[244] Note that the Sierra Juarez and the Sierra Cucapa are not a part of the CTCRA, but the presence of bighorn sheep in those ranges has implications for the persistence of bighorn sheep in the Peninsular ranges within the United States from the standpoint of gene flow and the potential for colonization of vacant or currently unoccupied habitat.

[245] Conservation Biology Institute and Terra Peninsular. 2010. Maintaining a landscape linkage for Peninsular bighorn sheep. Unpublished report prepared for The Nature Conservancy.

[246] Conservation Biology Institute and Terra Peninsular. 2010. Maintaining a landscape linkage for Peninsular bighorn sheep. Unpublished report prepared for The Nature Conservancy.

[247] U.S. Fish and Wildlife Service. 2000. Recovery plan for bighorn sheep in the Peninsular ranges, California.

[248] Conservation Biology Institute, Pronatura, and The Nature Conservancy. 2004. *Las Californias Binational Conservation Initiative*_a vision for habitat conservation in the border region of California and Baja California. Prepared for The San Diego Foundation, Resources Legacy Fund Foundation, and The International Community Foundation. Available at: http://www.consbio.org/cbi/Projects/show.php?page=lcbi

[249] Rubin, E. S. 2008. In the Matter of the application of San Diego Gas & Electric Company (U 902-E) for a certificate of public convenience and necessity for the Sunrise Powerlink Transmission Project. Phase II direct testimony of Esther Rubin on behalf of the Center for Biological Diversity and the Sierra Club. Critical review of bighorn sheep impacts described in the draft environmental impact report/enviornmental impact statement, January 2008.

A perimeter fence will not surround the Project, thereby potentially permitting PBHS movement through the site.[250] However, as the DEIS/DEIR acknowledges, the responses of bighorn sheep to wind turbines are unknown. Some investigators have suggested that once a primary disturbance (e.g., construction and human presence) is removed, ungulates (hoofed animals) will acclimate to remaining infrastructure.[251] Nevertheless, bighorn sheep are particularly sensitive to aerial predators, and it is uncertain how bighorn sheep in the vicinity of the Project site would perceive the rotating blades of the large wind turbines, particularly if the turbines do not operate continuously and operation is not predictable (to the sheep).[252] Moreover, bighorn sheep appear not to acclimate to helicopters, so speculation that PBHS will acclimate to Project infrastructure is just that: speculation.[253] Given responses of bighorn sheep to the Project (and wind facilities in general) are unknown but potentially significant, the DEIS/DEIR lacks the basis to conclude "[p]otential impacts to PBS would be minimized through the implementation of Mitigation Measures Wild-1s (*Prepare a Bighorn Sheep Mitigation and Monitoring Plan*), Wild-1hh (*Provide annual PBS status reports*), and Wild-2f (*Collect data on PBS movements during the first 3 years of operation*)."[254] Given that the Project has the potential to eliminate movement through the Project site, the Project could impact the recovery of PBHS in the CTCRA. Therefore, development of the Project may result in direct impacts to PBHS and habitat linkage(s) in the Recovery Area. The DEIS/DEIR fails to disclose the potentially severe consequences of these impacts.

P269-70, cont.

The DEIS/DEIR's statements that areas known to be used by PBHS as movement corridors are outside of the Project area (in one case 6 miles and in another case 2 miles), do not, in and of themselves, preclude the potential of the Project to have substantial impacts on the intermountain movement essential to bighorn sheep metapopulations.[255] Furthermore, the DEIS/DEIR's conclusion that there will be no impact to movement of bighorn sheep, is unsubstantiated. Indeed, that conclusion is not supported by literature on the topic. It is well known that bighorn sheep moving between occupied areas, or even from occupied areas into unoccupied areas, are capable of moving long distances, and that such movements may occur more frequently than previously recognized.[256,257] In fact, movements by bighorn sheep of distances far greater than 6 miles from

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[250] Draft EIS/EIR, Page 4.21-10.

[251] Walter, D. W., D. M. Leslie, Jr., and J. Jenks. 2006. Responses of Rocky Mountain elk (*Cervus elaphus*) to wind-power development. American Midland Naturalist 156:363-375.

[252] Stockwell, C. A. 1991. Behavioural reactions of desert bighorn sheep to avian scavengers. Journal of Zoology 225:563–566.

[253] Bleich, V. C., R. T. Bowyer, A. M. Pauli, M. C. Nicholson, and R. W. Anthes. 1994. Responses of mountain sheep *Ovis canadensis* to helicopter surveys: ramifications for the conservation of large mammals. Biological Conservation 45:1–7.

[254] Draft EIS/EIR, Page 4.21-21.

[255] Draft EIS/EIR, Page 4.21-9.

[256] Bleich, V. C., J. D. Wehausen, and S. A. Holl. 1990. Desert-dwelling mountain sheep: conservation implications of a naturally fragmented distribution. Conservation Biology 4:383-390.

[257] Epps, C. W., J. D. Wehausen, V. C. Bleich, S. G. Torres, and J. S. Brashares. 2007. Optimizing dispersal and corridor models using landscape genetics. Journal of Applied Ecology 44:714-724.

P269-70, cont.

stereotypical bighorn sheep habitat are being increasingly recognized,[258,259] and the value of intermountain areas like the Project site to metapopulation function and, in turn, population persistence, has been repeatedly emphasized in the literature.[260,261,262,263]

The argument that the Project site currently is unoccupied and, therefore, Project implementation will not result in further habitat fragmentation, is specious at best. There is evidence that bighorn sheep have occupied a portion of the Project site.[264] The absence of evidence from other portions of the Project site does not support the DEIS/DEIR's assertion that these portions of the Project site are unoccupied, especially considering that: a) when the DEIS/DEIR was written, bighorn sheep surveys (i.e., the Western Tracking Institute surveys) for the Project had not been completed; b) the survey data from the MERLIN Avian Radar system surveys had not been analyzed; and c) focused surveys for bighorn sheep on the Project site have been extremely limited, and they were not initiated until spring 2011 (aside from the 8 days of surveys conducted by Dr. Boyce in late 2009 and early 2010).[265]

P269-71

According to the DEIS/DEIR,

> "[t]he [PBHS] sign noted thus far includes three tracks and numerous bedding areas documented along ridgelines in the southwest portion of Site 1 and the southwest portion of Site 2. The sign documented to date is not considered to be from recent PBS activity because evidence of recent activity (e.g., scat, fresh tracks, and/or hair) has not been documented. In addition, the motion-triggered cameras have not documented movement of PBS into the OWEF project area. These results suggest these areas have been used in the past, but have not been used recently by PBS."[266]

I recently completed a study of PBHS at a site approximately 35 miles north of the Project. For the study, a crew of six intensively surveyed potential PBHS habitat over a 15-month period. The study incorporated a variety of survey techniques, and it included repeat survey attempts across the same terrain. Based on this study, as well as a thorough literature review, I was able to make the following conclusions:

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[258] Bleich, V. C., J. D. Wehausen, and S. A. Holl. 1990. Desert-dwelling mountain sheep: conservation implications of a naturally fragmented distribution. Conservation Biology 4:383-390.

[259] Epps, C. W., J. D. Wehausen, V. C. Bleich, S. G. Torres, and J. S. Brashares. 2007. Optimizing dispersal and corridor models using landscape genetics. Journal of Applied Ecology 44:714-724.

[260] Schwartz, O. A., V. C. Bleich, and S. A. Holl. 1986. Genetics and the conservation of mountain sheep *Ovis canadensis nelsoni*. Biological Conservation 37:179-190.

[261] Bleich, V. C., J. D. Wehausen, and S. A. Holl. 1990. Desert-dwelling mountain sheep: conservation implications of a naturally fragmented distribution. Conservation Biology 4:383-390.

[262] Bleich, V. C., J. D. Wehausen, R. R. Ramey II, and J. L. Rechel. 1996. Metapopulation theory and mountain sheep: implications for conservation. Pages 353-373 in D. R. McCullough (editor). Metapopulations and wildlife conservation. Island Press, Covelo, California.

[263] Bleich, V. C. 2005. Politics, promises, and illogical legislation confound wildlife conservation. Wildlife Society Bulletin 33:66-73.

[264] Draft EIS/EIR, Page 4.21-8.

[265] DEIS/DEIR, p. 3.23-22. *See also* MERLIN Avian Radar Survey report, p. 1. *See also* BTR, p. 18.

[266] DEIS/DEIR, p. 3.23-22.

1. The DEIS/DEIR must define what it considers to be "recent" activity. Based on the data obtained during my study, any detectable PBHS sign should be considered "recent" given the tendency for PBHS sign to quickly degrade in an arid and windy environment. On several occasions, my crew detected PBHS tracks or beds, yet observed that these signs were gone within weeks due to rainfall or off-highway vehicle activity. Similarly, PBHS pellets dry quickly in the hot desert sun, making it difficult to ascertain the freshness of scat. I have discussed this topic with several recognized bighorn sheep experts, and they have stated that it is nearly impossible to age sheep scat after it becomes at least two months old (i.e., two-month old scat may appear similar to scat that is several years old). My field observations, which were generated by inspecting hundreds of piles of PBHS scat over a 15-month period, substantiated the opinions of these experts. The detection of "numerous" bedding areas but only three tracks on the Project site attests to temporal limitations associated with sheep sign (i.e., what happened to all the other tracks, and if tracks were never deposited, how can they be used as a reliable method for detecting sheep presence, and how could the beds have been constructed?).[267] As a result of the issues described above, the DEIS/DEIR has no basis to conclude the PBHS sign observed on the Project site is not "recent."
2. PBHS use patterns are largely unpredictable, and they can vary substantially among seasons and years. For example, in portions of our study area we detected relatively abundant sheep sign during the spring, but no sign of sheep activity in the area during the other three seasons of the year. As a result, a focused survey effort that is limited to single season (as was done for the Project), or even year, does not reliably characterize PBHS use of an area.
3. Remote cameras are a relatively unreliable method for detecting PBHS, except when they are placed at a known use area (e.g., watering hole) at the appropriate times of year. On several occasions we placed cameras in areas where PBHS sign (e.g., scat) had recently been deposited, only to find that the cameras were unsuccessful in capturing photographs of sheep (despite having been operational for the preceding weeks or months). In addition, on at least one occasion we detected "fresh" (< 2 weeks old, as determined by its color and pliability) sheep tracks near one of our cameras, only to find that it too failed to capture photographs of a sheep. Overall, our cameras did not capture a single photograph of bighorn sheep, even though we were able to confirm sheep occurred in the area and that the cameras had functioned properly.
4. PBHS are not limited to stereotypical bighorn sheep habitat. In a few instances we detected PBHS sign in areas that appeared to have no value to sheep due to the lack of water, forage, escape terrain, or cover. In multiple other instances, and despite numerous attempts, we failed to detect sheep sign in areas that appeared to provide ideal habitat.
5. PBHS opportunistically forage as food sources become available (e.g., after new leaves emerge). PBHS will travel relatively long distances away from escape

P269-71, cont.

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[267] Id

terrain to capitalize on these food sources. Although the Project site contains several preferred food items, the DEIS/DEIR lacks any mention of the Applicant's consultant having surveyed the site for signs of sheep browsing (i.e., chewed vegetation).[268] Inspecting vegetation for signs of browsing is not only a good technique for documenting sheep presence, but it also has major implications on the DEIS/DEIR's impact assessment due to the nutritional demands of bighorn ewes during the time period surrounding lambing and nursing.[269] Specifically, the failure to acquire sufficient nutrients during the last two months of gestation and during nursing can adversely affect the survival of newborn lambs.[270]

P269-71, cont.

Thus, the Applicant has not collected adequate data to document the Project site's value to PBHS, and the potential for the Project to further fragment habitat for PBHS remains. The impacts of further fragmentation and their consequences to PBHS must be acknowledged in the DEIS/DEIR. Even under the premise that portions of the Project site are not currently occupied by bighorn sheep, vacant areas play potentially important roles in metapopulation dynamics, and ultimately in the persistence and recovery of PBHS.[271,272,273] In addition, because the Project is so close to the international border, it may impact movement corridors between Mexico and the United States. Connectivity among populations of large mammals across the international border is important to the persistence of bighorn sheep and other large mammals in both the United States and Mexico,[274] and habitat connectivity on both sides of the border is important to the conservation or restoration of bighorn sheep.[275] Resource agencies must promote habitat expansion and protect linkage corridors within the CTCRA because new habitat and movement corridors are critical to the recovery of the PBHS.

P269-72

Failure of the DEIS/DEIR to address the potential for the Project site to function as a movement corridor, compounded by the unsubstantiated conclusion that the site currently is unoccupied and that known movement corridors are located several miles away (and, by extension, are the only areas through which sheep move) is baseless, and a cause for concern. Minimally, the DEIS/DEIR must: a) acknowledge that the site could be important in providing opportunities for PBHS to travel between areas of known

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[268] BTR, Appendix B.

[269] U.S. Fish and Wildlife Service. 2000. Recovery plan for bighorn sheep in the Peninsular Ranges, California. U.S. Fish and Wildlife Service, Portland, OR. xv+251 pp.

[270] *Id.*

[271] Bleich, V. C., J. D. Wehausen, and S. A. Holl. 1990. Desert-dwelling mountain sheep: conservation implications of a naturally fragmented distribution. Conservation Biology 4:383-390.

[272] Epps, C. W., J. D. Wehausen, V. C. Bleich, S. G. Torres, and J. S. Brashares. 2007. Optimizing dispersal and corridor models using landscape genetics. Journal of Applied Ecology 44:714-724.

[273] Bleich, V. C., J. D. Wehausen, and S. A. Holl. 1990. Desert-dwelling mountain sheep: conservation implications of a naturally fragmented distribution. Conservation Biology 4:383-390.

[274] Flesch, A. D., C. W. Epps, J. W. Cain III, M. Clark, P. R. Krausman, and J. R. Morgart. 2010. Potential effects of the United States-Mexico border fence on wildlife. Conservation Biology 24:171-181.

[275] Andrew, N. G., V. C. Bleich, and P. V. August. 1999. Habitat selection by mountain sheep in the Sonoran Desert: implications for conservation in the United States and Mexico. California Wildlife Conservation Bulletin 12:1-30.

P269-72, cont.

occupied bighorn sheep habitat; and b) fully disclose the severity of impacts associated with blocking sheep movements. In the absence of data to the contrary, the conclusion that the Project area is not used by bighorn sheep moving between areas of stereotypical bighorn sheep habitat, or even occupying the Project site in the future, is indefensible.

II. The DEIS/DEIR Fails to Identify or Mitigate Impacts to Forage Habitat

P269-73

The DEIS/DEIR states clearly that, "[l]ow rolling and flat terrain including foothills and washes provide an alternative source of high-quality browse forage during times when resources become limited…"[276] It subsequently cites USFWS (2001) to substantiate the statement.[277] The DEIS/DEIR's statement is wrong, and it does not reflect the information presented in USFWS (2001).[278] Bighorn sheep do not seek forage in such places when "resources become limiting" in otherwise suitable areas. Rather, female bighorn sheep are physiologically tied to maximizing nutrient intake in order to maximize the potential of successful reproduction on an annual basis. Research demonstrates that low-lying areas and associated washes, such as those that characterize much of the Project site, are considerably more important to bighorn sheep than portrayed in the DEIS/DEIR.[279] Unfortunately, the DEIS/DEIR fails to analyze the significance of the potential nutritional benefits to be incurred by PBHS that may utilize the Project site during critically important times of the year. Thus, the second major weakness in the DEIS/DEIR is the failure to recognize the importance of lower elevation habitats in providing nutritional benefits to bighorn sheep. This shortcoming is surprising because the Project site is in a lower-elevation area with many desert washes, a habitat type known to provide rich forage for bighorn sheep, particularly during springtime. The DEIS/DEIR's failure to discuss the loss of potentially critical foraging resources on the Project site is a fatal flaw that cannot be overlooked due to the precarious future of the PBHS.

Low lying areas and, in particular desert washes, are among the most productive habitats in the Sonoran Desert. These habitats support higher cover of vegetation and far greater plant biomass than surrounding upland areas.[280,281] Although such areas likely are not used on a year-round basis, they are at times, critically important to bighorn sheep in terms of nutrient acquisition. Indeed, 87% of young in the Peninsular ranges are born during February, March, and April, coincident with one of two peaks in diet quality that occur among bighorn sheep in the region.[282] Thus, the potential importance of the Project site to female bighorn sheep for the purposes of acquiring high-quality forage (i.e., newly emergent or actively growing vegetation, which is highest in moisture content, digestibility, and crude protein)[283] during late gestation, or enhancement of body condition — which can have a profound effect on reproduction the following year — is underemphasized in the DEIS/DEIR.

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[276] Biological Technical Report for Ocotillo Wind Energy Facility / AEG-09 / June 14, 2011, page 46.

[277] Id.

[278] U.S. Fish and Wildlife Service. 2000. Recovery plan for bighorn sheep in the Peninsular Ranges, California. U.S. Fish and Wildlife Service, Portland, OR. xv+251 pp., p. 158.

[279] U.S. Fish and Wildlife Service. 2000. Recovery plan for bighorn sheep in the Peninsular Ranges, California. U.S. Fish and Wildlife Service, Portland, OR. xv+251 pp.

[280] Andrew, N. G. 1994. Demography and habitat use of desert-dwelling mountain sheep in the East Chocolate Mountains, Imperial County, California. MS Thesis, University of Rhode Island, Kingston, Rhode Island, USA.

[281] Marshal, J. P., P. R. Krausman, and V. C. Bleich. 2005. Dynamics of mule deer forage in the Sonoran Desert. Journal of Arid Environments 60:593-609.

P269-73, cont.

Forages used by bighorn sheep elsewhere in California similarly reflect an increase in forage or diet quality during the spring growing season.[284,285,286,287] For the DEIS/DEIR to argue that low-lying areas and associated washes provide forage resources only when resources elsewhere become limiting is wholly without merit. On the contrary, low-lying areas, and particularly washes, are used by bighorn sheep for foraging whenever plant phenology is appropriate and, although such use may occur only for short periods of time, it can play critically important roles in the life history of bighorn sheep. Indeed, patterns and amounts of precipitation, and resultant productivity of vegetation,[288,289] affect the distribution of bighorn sheep and, ultimately, the probability of persistence of populations of that species.[290] Of the vegetation found on the Project site[291], many species are utilized as forage by bighorn sheep[292,293,294,295] including, but not limited to: *Aristida* spp.,

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[282] Rubin, E. S., W. M. Boyce, and V. C. Bleich. 2000. Reproductive strategies of desert bighorn sheep. Journal of Mammalogy 81:769-786.

[283] Marshal, J. P., P. R. Krausman, and V. C. Bleich. 2005. Rainfall, temperature, and forage dynamics affect nutritional quality of desert mule deer forage. Rangeland Ecology and Management 58:360-365.

[284] Bleich, V. C., R. T. Bowyer, D. J. Clark, and T. O. Clark. 1992. Quality of forages eaten by mountain sheep in the eastern Mojave Desert, California. Desert Bighorn Council Transactions 36:41-47.

[285] Oehler, M. W., Sr., R. T. Bowyer, and V. C. Bleich. 2003. Home ranges of mountain sheep: effects of precipitation in a desert ecosystem. Mammalia 67:385-402.

[286] Oehler, M. W., V. C. Bleich, R. T. Bowyer, and M. C. Nicholson. 2005. Mountain sheep and mining: implications for conservation and management. California Fish and Game 91:149-178.

[287] Wehausen, J. D. 2005. Nutrient predictability, birthing seasons, and lamb recruitment for desert bighorn sheep. Pages 37-50 in J. Goerrissen and J. M. Andre, editors. Sweeney Granite Mountains Desert Research Center 1978-2003. A Quarter Century of Research and Teaching. University of California Natural Reserve System, Riverside, California, USA. *See also* Wehausen, J. D. 2005. Nutrient predictability, birthing seasons, and lamb recruitment for desert bighorn sheep. Pages 37-50 in J. Goerrissen and J. M. Andre (editors). Sweeney Granite Mountains Desert Research Center 1978-2003. A Quarter Century of Research and Teaching. University of California Natural Reserve System, Riverside, California, USA.

[288] Marshal, J. P., P. R. Krausman, and V. C. Bleich. 2005. Rainfall, temperature, and forage dynamics affect nutritional quality of desert mule deer forage. Rangeland Ecology and Management 58:360-365.

[289] Wehausen, J. D. 2005. Nutrient predictability, birthing seasons, and lamb recruitment for desert bighorn sheep. Pages 37-50 in J. Goerrissen and J. M. Andre (editors). Sweeney Granite Mountains Desert Research Center 1978-2003. A Quarter Century of Research and Teaching. University of California Natural Reserve System, Riverside, California, USA.

[290] Oehler, M. W., Sr., R. T. Bowyer, and V. C. Bleich. 2003. Home ranges of mountain sheep: effects of precipitation in a desert ecosystem. Mammalia 67:385-402.

[291] Biotech Report, Pages B1-B7.

[292] Weaver, R. A., J. L. Mensch, and W. V. Fait. 1968. A survey of the California desert bighorn (*Ovis canadensis*) in San Diego County. California Department of Fish and Game, Federal Aid in Wildlife Restoration Project W-51-R-14. Final Report.

Ephedra nevadensis, *Krameria grayi*, *Cercidium floridum*, *Sphaeralcea ambigua*, *Encelia farinosa*, *Opuntia* spp., *Larrea tridentata*, *Ditaxis* spp., *Bebbia juncea*, and *Phoradendron californicum*. Thus, the DEIS/DEIR's analysis of the Project's impacts to bighorn sheep habitat, particularly wash habitat, is inadequate. The DEIS/DEIR's analysis of the importance of wash habitat to the survival of PBHS occupying nearby stereotypical bighorn sheep habitat is similarly inadequate.

P269-73, cont.

III. The DEIS/DEIR Fails to Identify and Mitigate the Potential Loss of 13,000 Acres of PBHS Habitat

The DEIS/DEIR simply recognizes the loss of approximately 200 acres of PBHS habitat that will be impacted by Project implementation through infrastructure development; it fails to acknowledge the real possibility that PBHS habitat across the entire Project site will be lost. Although the Project site will not be fenced in its entirety, the responses of bighorn sheep to the presence of the wind turbines has the potential to eliminate use of the Project area by those large, specialized ungulates. Further, the Project area supports a vast number of desert washes[296], a habitat type that provides important forage resources to female bighorn sheep during their annual cycle.[297,298,299] Thus, the Project holds the potential to impact PBHS across an area that far exceeds the 13,000 acre "footprint" that will occur largely on land administered by the BLM, and upon which the viability of PBHS in the southern Peninsular ranges may be dependent. Indeed, the potential impacts of the Project on a) movement corridors and their functions in population and metapopulation persistence; b) bighorn sheep life history requirements through loss of vital foraging areas and subsequent influences on population dynamics; and ultimately c) the potential for colonization of the Project area by bighorn sheep and the recovery of PBHS in the Peninsular ranges, must be analyzed in the context of what is known about bighorn sheep life histories, nutritional needs, and population structure.

P269-74

Perhaps more consequential is the DEIS/DEIR's failure to emphasize the significance of the Project in the context of "Essential Habitat" as defined in the recovery plan for

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[293] Hicks, L. L. 1978. The status and distribution of Peninsular bighorn sheep in the In-Ko-Pah Mountains, California. USDI Bureau of Land Management, Riverside District, El Centro, California, USA.

[294] Dodd, N. 1989. Dietary considerations. Pages 109-134 in R. M. Lee (editor). The desert bighorn sheep in Arizona. Arizona Game and Fish Department, Phoenix, Arizona, USA.

[295] Scott, J. E. 1986. Food habits and nutrition of desert bighorn sheep (*Ovis canadensis cremnobates*) in the Santa Rosa Mountains, California. MS Thesis, California State Polytechnic University, Pomona, California, USA.

[296] Biological Technical Report for Ocotillo Wind Energy Facility / AEG-09 / June 14, 2011, Figures 11A – 11D.

[297] Wehausen, J. D. 2005. Nutrient predictability, birthing seasons, and lamb recruitment for desert bighorn sheep. Pages 37-50 *in* J. Goerrissen and J. M. Andre (editors). Sweeney Granite Mountains Desert Research Center 1978-2003. A Quarter Century of Research and Teaching. University of California Natural Reserve System, Riverside, California.

[298] Marshal, J. P., P. R. Krausman, and V. C. Bleich. 2005. Rainfall, temperature, and forage dynamics affect nutritional quality of desert mule deer forage. Rangeland Ecology and Management 58:360-365.

[299] Oehler, M. W., Sr., R. T. Bowyer, and V. C. Bleich. 2003. Home ranges of mountain sheep: effects of precipitation in a desert ecosystem. Mammalia 67:385-402.

PBHS.[300] The DEIS/DEIR acknowledges that the Project area incorporates areas identified as Essential Habitat, but trivializes its significance. Specifically, it states: "[w]hile USFWS Essential Habitat for bighorn sheep occurs in the southwest corner of Site 1, in the west-central portion of Site 1, and in the southwestern portion of Site 2, none of these areas appear to be regularly used by the species.[301] However, it is recognized that bighorn sheep may occasionally use the flat desert terrain and desert washes in the Essential Habitat areas as an alternative source of forage during times when resources become limited, but bighorn sheep have not been documented within Essential Habitat in the proposed OWEF site during other surveys conducted between 2009 and 2011."[302] The presence of approximately 24 wind turbines within the Essential Habitat boundary, the Project site's proximity to Critical Habitat, and the known occurrence of PBHS on the boundary of area 1 are acknowledged clearly.[303] Yet, nowhere in the DEIS/DEIR is there a discussion of the relevance of Essential Habitat to the continued viability of bighorn sheep in the Peninsular ranges. Furthermore, not "appearing to be regularly used" does not mean that these areas are not highly important to sheep. This is extensively articulated in the recovery plan. Further, the argument that sheep use washes as an alternative source of forage only during times when resources become limited is nonsensical, given the nutritional requirements of female bighorn sheep, as discussed above. Sheep use those areas to maximize nutrient intake during critically important times of the year, particularly during springtime "greenup."[304] Moreover, that sheep have not been documented within Essential Habitat is a meaningless observation from which to draw conclusions; absence of evidence does not equate to evidence of absence. This argument is especially problematic, given the concordance between Essential Habitat and a model developed on data derived by knowledgeable investigators[305] and that was, in part, relied upon to modify the original Project proposal.[306] Indeed, the developers of the model concluded "[h]abitat delineations resulting from GARP models were similar to the expert-based model, affirming that the expert-based model [upon which the delineation of Essential Habitat was based] provided a useful delineation of bighorn sheep habitat in the Peninsular Ranges."[307]

P269-74, cont.

At a minimum, the DEIS/DEIR needs to address the impact of the potential loss of 13,000 acres of habitat, justify the Project's intrusion on "Essential Habitat," and propose appropriate mitigation(s) for those impacts. Monitoring, cessation of activity when a sheep comes within a certain distance threshold of construction activity, and an annual report to not constitute appropriate or adequate mitigation given the potential impacts of the development to a federally listed Distinct Population Segment of bighorn sheep. Given the implications of the Project on the persistence of PBHS in the southern Peninsular ranges, a formal consultation with the U.S. Fish and Wildlife Service clearly is warranted, particularly in the context of the cumulative impacts associated with nearby proposed energy (and other) developments.[308]

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[300] U.S. Fish and Wildlife Service. 2000. Recovery plan for bighorn sheep in the Peninsular ranges, California.

[301] DEIS/DEIR, p. 3.23-22.

[302] Draft EIS/EIR, Page 3.23-22.

[303] Draft EIS/EIR, Appendix A, Figure 4.21-1.

[304] Wehausen, J. D. 2005. Nutrient predictability, birthing seasons, and lamb recruitment for desert bighorn sheep. Pages 37-50 *in* J. Goerrissen and J. M. Andre (editors). Sweeney Granite Mountains Desert Research Center 1978-2003. A Quarter Century of Research and Teaching. University of California Natural Reserve System, Riverside, California, USA.

[305] Rubin, E. S., C. J. Stermer, W. M. Boyce, and S. G. Torres. 2009. Assessment of predictive habitat models for bighorn sheep in California's Peninsular ranges. Journal of Wildlife Management 73:859-869.

[306] Biological Technical Report for Ocotillo Wind Energy Facility / AEG-09 / June 14, 2011, page 47.

[307] Rubin, E. S., C. J. Stermer, W. M. Boyce, and S. G. Torres. 2009. Assessment of predictive habitat models for bighorn sheep in California's Peninsular ranges. Journal of Wildlife Management 73:859-869.

P269-74, cont.

Mule Deer

In reviewing the DEIS/DEIR[309], it became obvious that no consideration was given to the impacts of the proposed Project on mule deer (*Odocoileus hemionus* ssp.), even though mule deer occur nearby in Anza-Borrego Desert State Park[310], and throughout the Peninsular ranges in suitable habitat. The DEIS/DEIR's failure to discuss potential Project impacts to this iconic ungulate is unfortunate, given their ecological, social, and economic values.[311] Mule deer likely are not important competitors of PBHS in the peninsular ranges[312], but deer occupy smoketree washes and ocotillo tall scrub in the Colorado Desert,[313] habitat types that occur on the proposed Project site. Washes are important habitat for mule deer,[314,315,316,317] and they provide highly nutritious forage for

P269-75

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[308] Draft EIS/EIR, pages 4.21-34 and 4.21-35.

[309] Ocotillo Express Wind Energy Project. Bureau of Land Management Case File Number CACA051552. Available at: http://www.blm.gov/ca/st/en/fo/elcentro/nepa/ocotillo_express_wind.html

[310] Bowyer, R. T., and V. C. Bleich. 1984. Distribution and taxonomic affinities of mule deer, Odocoileus hemionus, from Anza-Borrego Desert State Park, California. California Fish and Game 70:53-57.

[311] Mule Deer Working Group. 2004. North American mule deer conservation plan. Western Association of Fish and Wildlife Agencies, Cheyenne, Wyoming.

[312] Weaver, R. A., J. L. Mensch, and W. V. Fait. 1968. A survey of the California desert bighorn (*Ovis canadensis*) in San Diego County. Wildlife Management Branch, California Department of Fish and Game, Sacramento.

[313] Weaver, R. A., and J. L. Mensch. 1970. Bighorn sheep in southern Riverside County. Wildlife Management Administrative Report 70-5. California Department of Fish and Game, Sacramento.

[314] Marshal, J. P., V. C. Bleich, P. R. Krausman, M. L. Reed, and N. G. Andrew. 2006. Factors affecting habitat use and distribution of desert mule deer in an arid environment. Wildlife Society Bulletin 34:609-619.

[315] Blong, B. 1993. Use of habitat by Colorado Desert deer. California Department of Fish and Game, Sacramento.

[316] Krausman, P. R., K. R. Rautenstrauch, and B. D. Leopold. 1985. Xeroriparian systems used by desert mule deer in Texas and Arizona. Pages 144–149 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators. Riparian ecosystems and their management: reconciling conflicting uses. United States Department of Agriculture Forest Service General Technical Report RM-120, Washington, D.C.

[317] Rodgers, K. J., P. F. Ffolliott, and D. R. Patton. 1978. Home range and movement of 5 mule deer in a semidesert grass-shrub community. Research Note RM-355, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

deer and PBHS.[318] As such, the DEIS/DEIR is remiss in (1) not considering or searching for evidence of mule deer on the Project site, and (2) not addressing the implications of Project implementation on habitat loss, either directly or indirectly, for mule deer.

As is the situation with other large, vagile mammals, the effects of habitat fragmentation and the consequences thereof on mule deer are of concern, and impacts can be either direct (e.g., energy development or road construction that result in outright habitat destruction) or indirect (e.g., through the spread of invasive vegetation and its effects on nutrient acquisition, or displacement as a result of disturbance).[319] The DEIS/DEIR has inexplicably omitted any discussion of the potential impacts of the Project on habitat quality or availability for mule deer, even though the BLM has addressed these issues in DEIS's prepared for other renewable projects.[320] Moreover, and as is the case with bighorn sheep, the persistence of mule deer populations is dependent upon connectivity between or among areas of suitable habitat; to disrupt such connectivity has implications for population persistence at a landscape-level. Indeed, "habitat fragmentation creates landscapes made of altered habitats or developed areas fundamentally different from those shaped by natural disturbances that species have adapted to over evolutionary time"[321], and the implications of habitat fragmentation for the conservation of mule deer cannot be ignored as they have been in the DEIS/DEIR. For these reasons, the DEIS/DEIR must be revised to address the (1) potential presence of mule deer on the project site; (2) the anticipated impacts of project development on mule deer; and (3) measures that will be implemented to mitigate any potentially significant Project impacts.

P269-75, cont.

Barefoot Banded Gecko

The barefoot banded gecko is a state listed threatened species. The Applicant's consultant conducted protocol surveys for the species in 2010. However, after the surveys were completed the Project was redesigned such that Project features now fall outside of the 2010 barefoot banded gecko survey areas.[322] According to the DEIS/DEIR, "[t]he portions of the proposed project that fall outside the 2010 survey areas will be surveyed in 2011."[323] The DEIS/DEIR fails to identify the portions of the current Project area that were not surveyed in 2010 (i.e., the portions that require surveys

P269-76

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[318] Marshal, J. P., P. R. Krausman, and V. C. Bleich. 2005. Rainfall, temperature, and forage dynamics affect nutritional quality of desert mule deer forage. Rangeland Ecology and Management 58:360-365.

[319] Heffelfinger, J. R., C. Brewer, C. H. Alcalá-Galván, B. Hale, D. L. Weybright, B. F. Wakeling, L. H. Carpenter, and N. L. Dodd. 2006. Habitat Guidelines for Mule Deer: Southwest Deserts Ecoregion. Western Association of Fish and Wildlife Agencies, Cheyenne, Wyoming. Available at: http://www.deernut.com/Documents/SW_MD_Habitat_Guidelines.pdf

[320] *See* CEC and BLM. 2010 Mar. Staff Assessment and Environmental Impact Statement for the Genesis Solar Energy Project.

[321] Noss, R. F., and A. Y. Cooperrider. 1994. Saving nature's legacy. Island Press, Washington, D.C. (not seen; cited by Heffelfinger et al. (2006).

[322] BTR, p. 13.

[323] Id.

prior to Project construction), including their size, relationship to Project features, and suitability as gecko habitat.

The Project site contains areas that have identified as suitable habitat for the barefoot banded gecko.[324] Whereas some portions of this suitable habitat have been (or will be) surveyed for geckos, others have been excluded from the survey efforts.[325] The DEIS/DEIR fails to explain the rationale for excluding some portions of the Project site from surveys even though they contain suitable gecko habitat.

The Project includes the installation of approximately 1.5 miles of collection lines to connect Site 1 with Site 2.[326] Based on my review of topographic maps, aerial imagery, and the information provided in the DEIS/DEIR, a portion of the collection line route will travel through potentially suitable barefoot banded gecko habitat.[327] However, the DEIS/DEIR fails to provide information on the suitability of this habitat, or explicitly state that the Project's linear features will be subject to the proposed mitigation measures (including protocol surveys).

The DEIS/DEIR concludes the Project has the potential to have significant indirect impacts on the barefoot banded gecko.[328] Indirect impacts that may occur as the result of Project include noise, vibration, night lighting, introduction or spread of invasive weed species, and fugitive dust.[329] At least some of these indirect impacts have the potential to extend into areas that were not (or will not) be surveyed, and that may be occupied by the barefoot banded gecko. Consequently, the Project may result in an unmitigated, significant impact to the barefoot banded gecko.

P269-76, cont.

According to the DEIS/DEIR, "[p]rior to the start of construction, all areas not previously surveyed for barefoot banded gecko shall be surveyed in accordance with the survey protocol for the species (CDFG 2010a). If barefoot banded gecko is determined to be present within the proposed OWEF footprint, or within 50 feet of the proposed OWEF footprint, the proponent shall be required to obtain a 2081 permit for incidental take of the species prior to the start of construction and comply with the conditions of the permit during construction and O&M."[330] The California Endangered Species Act ("CESA") requires mitigation that fully offsets impacts to state listed species. The proposed mitigation does not ensure potentially significant Project impacts to the barefoot banded gecko will be fully mitigated, as required by CESA. Specifically,

1. The DEIS/DEIR lacks any compensation for impacts to the barefoot banded gecko or its habitat. Under CESA, full mitigation usually requires habitat compensation at a ratio greater than 1:1. The higher ratio required for full mitigation reflects the limits to increases in carrying capacity that can be achieved

P269-77

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[324] BTR, Figure 6.
[325] Id.
[326] DEIS/DEIR, Figure 2.1-2.
[327] BTR, Figure 6.
[328] BTR, p. 66.
[329] BTR, p. 75.
[330] BTR, p. 96.

on the acquired lands, even with implementation of all possible protection and enhancement measures.

2. The DEIS/DEIR's proposed mitigation measure will only be triggered if the barefoot banded gecko is determined to be present within 50 feet of the proposed footprint. The potentially significant indirect impacts discussed in the DEIS/DEIR may extend well beyond 50 feet. For example, studies have shown that certain desert reptiles are sensitive to low-intensity sound, and that the adverse effects of noise can be particularly significant on geckos (and other nocturnal species) because they lack full use of photoreceptors or vision (i.e., they greatly depend on their hearing).[331]
3. The DEIS/DEIR states barefoot banded gecko surveys will be required in all areas not previously surveyed. However, it fails to clarify where these areas are located, or what it considers to be "all areas" (e.g., the entire Project site plus buffers). Furthermore, and is the case for numerous other sensitive biological resources, the DEIS/DEIR has not demonstrated that additional surveys are feasible given the proposed timeline for the Project. As a result, the mitigation measure is too vague to be effectively evaluated.

P269-77, cont.

The Project has the potential to contribute to a cumulatively considerable impact on the barefoot banded gecko.[332] The DEIS/DEIR makes the following statements regarding cumulative impacts to the species:

a. "[t]he magnitude of the cumulative impact to barefoot banded gecko habitat is small given that there [*sic*] tens of thousands of acres within the cumulative impacts analysis area (the exact area of occupied gecko habitat is not known)."[333]
b. "[i]mplementation of Mitigation Measure Wild-1k for the proposed OWEF would render the proposed OWEF's contribution to the cumulative impact less than significant under CEQA."[334]

These statements are unfounded. As the DEIS/DEIR acknowledges, the barefoot banded gecko has a limited distribution, and "the exact area of occupied gecko habitat is not known."[335] Therefore, it has no basis to conclude that there are "tens of thousands of acres" of habitat within the cumulative impacts analysis area. Furthermore, as the DEIS/DEIR acknowledges, the cumulative Project impacts have the potential to "reduce the extent and population size of the species."[336] Measure Wild-1k does not provide any mitigation (e.g., habitat compensation) for the Project's contribution to this potentially significant impact.

As a result of the issues described above, the Project may have an unmitigated,

P269-78

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[331] Manci KM, DN Gladwin, R Villella, MG Cavendish. 1988. Effects of aircraft noise and sonic booms on domestic animals and wildlife: a literature synthesis. National Ecology Research Center Report # NERC-88/29.

[332] DEIS/DEIR, p. 4.21-38.

[333] Id.

[334] Id.

[335] Id.

[336] Id.

P269-78, cont.

significant impact on the barefoot banded gecko, and it may not meet CESA's requirement for full mitigation.

Colorado Desert Fringe-toed Lizard

P269-79

According to the DEIS/DEIR, "[t]he majority of the lower elevation [Project] area east of Shell Road is comprised of fine, windblown sand containing hummocks."[337] These conditions provide suitable habitat for the Colorado Desert fringe-toed lizard, a BLM Sensitive Species and a state listed Species of Special Concern.[338] Colorado Desert fringe-toed lizards occur in the Colorado and Sonoran deserts in areas that contain fine, loose, wind-blown sand, and they have been documented occurring within 10 miles of the Project site.[339]

According to the California Natural Diversity Database, there are documented occurrences of Colorado Desert fringe-toed lizards within 10 miles of the Project site. Despite these facts, the DEIS/DEIR lacks any discussion of the Project's potential impacts on Colorado Desert fringe-toed lizards.

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[337] BTR, p. 37.

[338] California Wildlife Habitat Relationships System. 2005. California Department of Fish and Game. California Interagency Wildlife Task Group. CWHR version 8.1 personal computer program. Sacramento (CA).

[339] California Natural Diversity Database. 2009. Rarefind [computer program]. Version 3.1.0. Sep 3, 2011. Sacramento (CA): Wildlife & Habitat Data Analysis Branch. California Department of Fish and Game.

The DEIS/DEIR Fails to Provide Mitigation Measures that Would Minimize Potential Impacts to American Badgers on the Project Site

The Applicant's consultant documented several American badger dens in close proximity to proposed Project features.[340] To mitigate potentially significant Project impacts to the American badger, the DEIS/DEIR proposes a pre-construction clearance survey concurrent with the pre-construction survey for burrowing owls.[341] Although the DEIS/DEIR fails to specify the timing of pre-construction badger surveys in relation to ground disturbance activities, the CBOC protocol allows pre-construction owl surveys up to 30 days before construction. Some badgers dig a new den each night.[342] As a result, surveys that are conducted several days or weeks before ground disturbance are not sufficient to avoid take of badgers. Consequently, the DEIS/DEIR must require pre-construction clearance surveys for badgers immediately before all ground disturbance activities. **P269-80**

Desert Kit Fox

The Applicant's consultant detected desert kit fox on the Project site.[343] California Code of Regulations 14 CCR § 460 stipulates that desert kit fox may not be taken at any time. The DEIS/DEIR fails to disclose this information in its discussion of regulations pertaining to the Project. Moreover, the DEIS/DEIR fails to provide any information on the number of kit fox and/or kit fox dens that would be impacted by the Project, an assessment of Project impacts to kit fox, or mitigation to prevent the take of kit fox during Project construction and due to O&M activities. **P269-81**

The DEIS/DEIR Fails to Address the Project's Contribution to Fragmentation

The ability to move across the landscape is essential for many species, especially those that occur as metapopulations. A "metapopulation" is a population that has a spatially discrete distribution, and for which at least one or more local populations has a non-trivial probability of extinction.[344] Several of the special-status species that occur in the Project region are known to exhibit a metapopulation structure. These include the bighorn sheep, Colorado Desert fringe-toed lizard, golden eagle, burrowing owl, and Le Conte's thrasher (among others). Maintaining the ability for these species to move across the landscape (i.e., connectivity) is the key determinant in the fate of each metapopulation, and ultimately the entire population.[345] **P269-82**

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[340] DEIS/DEIR, p. 4.21-7.

[341] Id, p. 4.21-47.

[342] Messick JP, MG Hornocker. 1981. Ecology of the badger in southwestern Idaho. Wildl. Monogr. No.76. 53pp.

[343] BTR, Appendix C.

[344] McCullough DR. 1996. Introduction. Pages 1-10 in DR McCullough, editor. Metapopulations and Wildlife Conservation. Island Press, Washington (DC).

[345] Lidicker WZ Jr, WD Koenig. 1996. Responses of Terrestrial Vertebrates to Habitat Edges and Corridors. Pages 85-109 in DR McCullough, editor. Metapopulations and Wildlife Conservation. Island Press, Washington (DC).

Incredibly, the DEIS/DEIR lacks any substantive discussion or analysis of the Project's contribution to fragmentation and loss of landscape-level connectivity. Based on independent research, in addition to the numerous issues I have discussed above, it is my professional opinion that the Project may have an unmitigated, significant impact on wildlife movement and the metapopulation dynamics necessary to maintain viable populations of several species.

The California Department of Transportation and CDFG commissioned the "California Essential Habitat Connectivity Project" because a functional network of connected wildlands is essential to the continued support of California's diverse natural communities in the face of human development and climate change.[346] The resulting report includes maps that depict large, relatively natural habitat blocks that support native biodiversity ("Natural Landscape Blocks") and areas essential for ecological connectivity between them ("Essential Connectivity Areas"). Many Essential Connectivity Areas connect highly intact wilderness and park lands across private or federally managed multiple-use lands, which support mostly natural landcovers and are relatively permeable to wildlife movements. In these "low-contrast" situations, managing to sustain wildlife movements between existing protected areas may be the primary conservation approach.

As depicted in the figures below, the Project site is located within an Essential Connectivity Area.

P269-82, cont.

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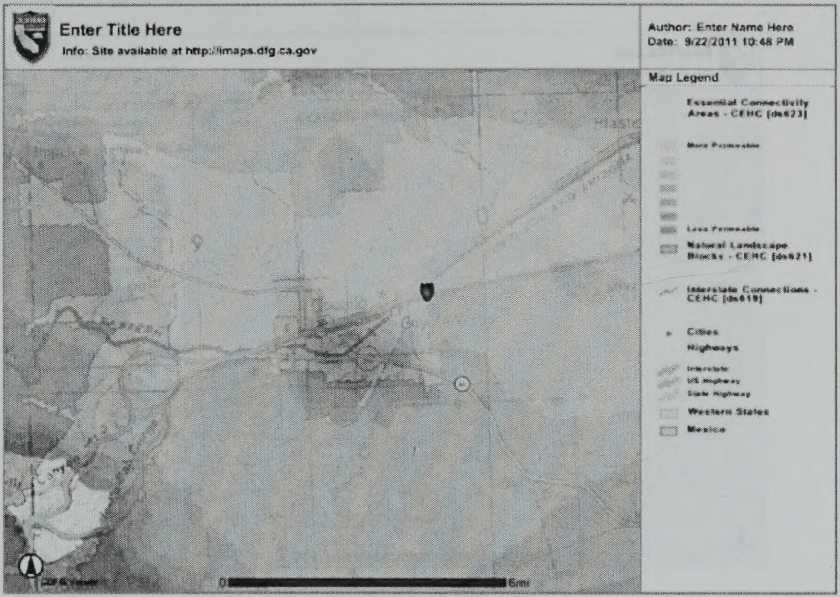
[346] *See* http://www.dfg.ca.gov/habcon/connectivity/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Map Output

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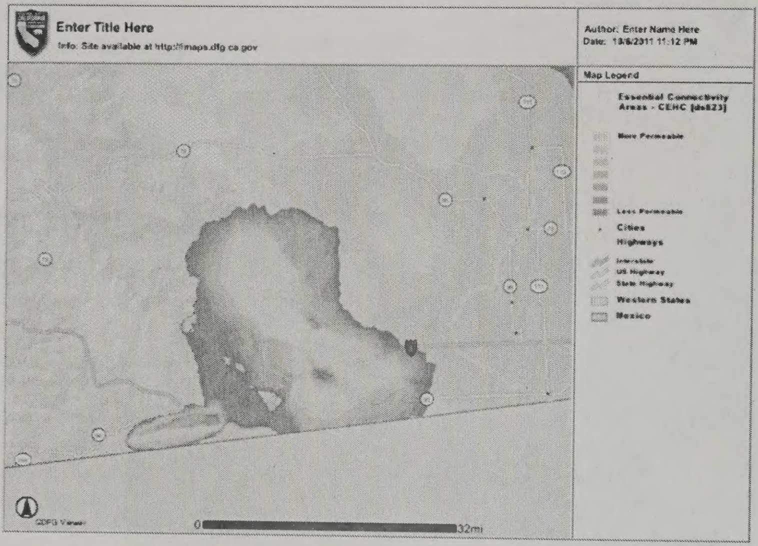
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Sincerely,

Scott Cashen, M.S.
Senior Biologist